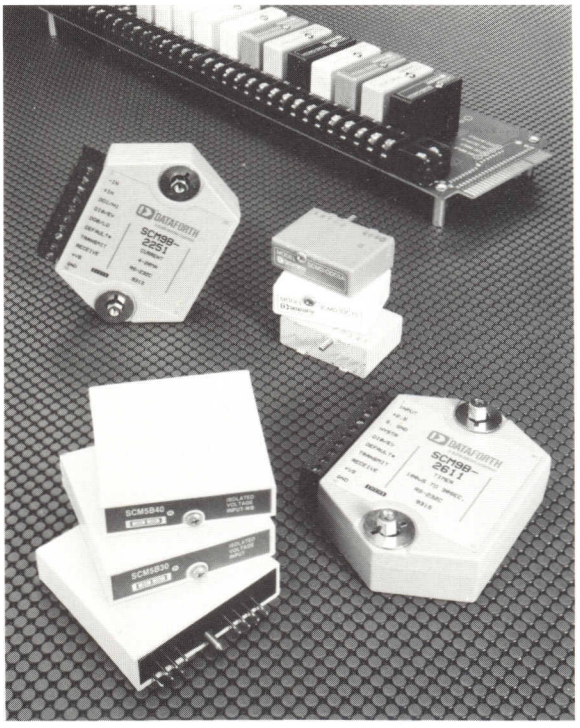
Product Catalog

SCM Series

Isolated Signal Conditioning Products



DATAFORTH®
A Burr-Brown Company

Dataforth Corporation

Dataforth Corporation was established in 1984 and has become a worldwide leader in the design and manufacture of signal conditioning and data communications products for industrial and institutional markets. The Company offers a broad range of analog and digital I/O modules and accessories, industrial modems and multiplexers, and STD Bus I/O boards.

Protects Signal Integrity, System Investment

Customers depend on the high performance and reliability of the Company's products to maintain the integrity of measurement and control signals, computers, and peripherals within harsh electrical environments. In the final analysis, these critical components operate to protect the large investments made by Original Equipment Manufacturers and End-Users in their higher-level industrial automation and process control products and systems.

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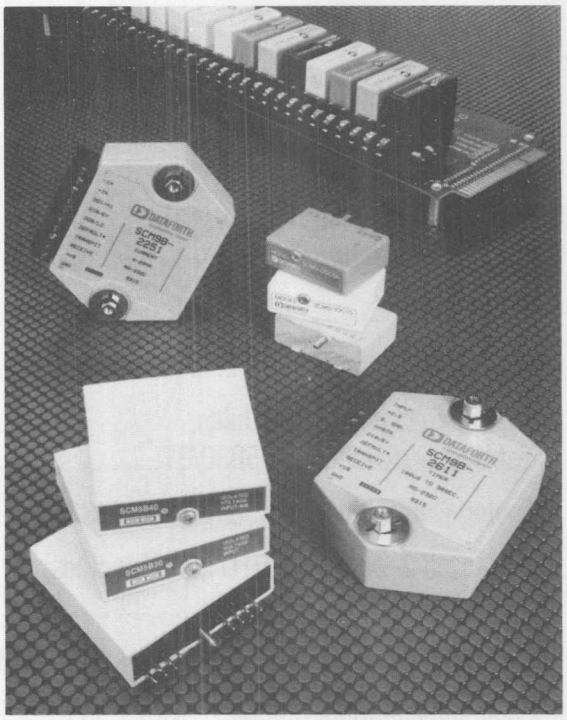
SCM Series Isolated Signal Conditioning Products

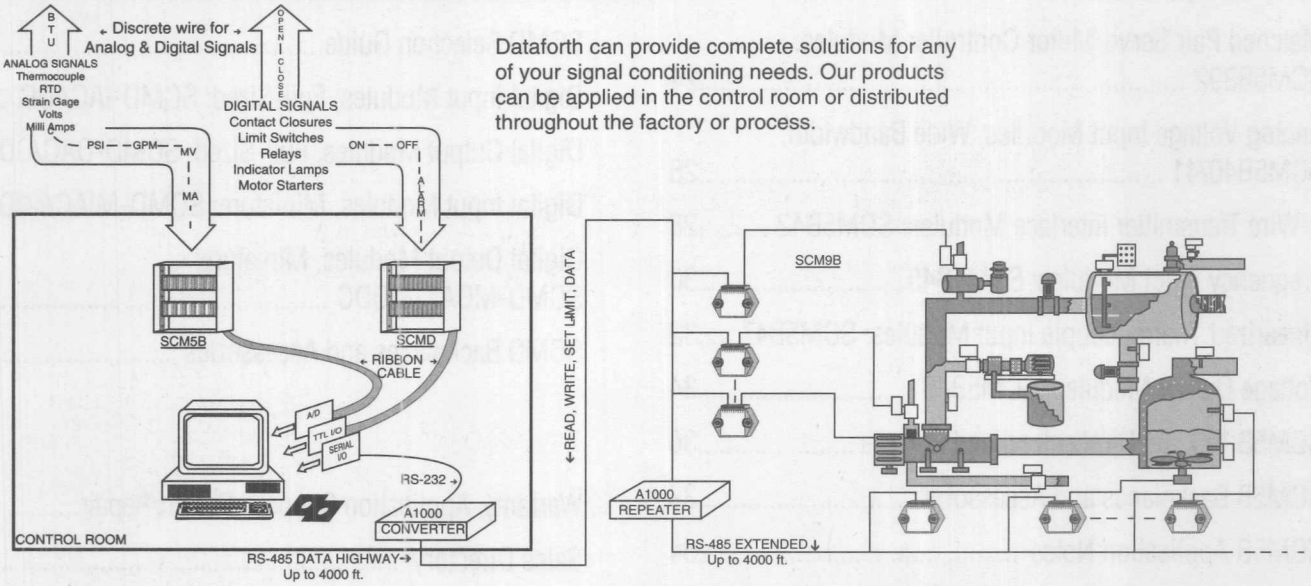
SCM Products Increase Productivity, Raise ROI

Our SCM signal conditioning products play a vital role in maintaining the integrity of industrial automation and quality assurance systems. They protect valuable measurement and control signals and equipment from the dangerous and degrading effects of noise, transient power surges, internal ground loops, and other hazards present in industrial environments. By improving the reliability and performance of expensive data acquisition, process control, product test, and similar equipment and systems, they raise productivity and increase the return on the user's industrial automation investment.

We offer several families of analog and digital I/O products and accessories, plus full customer service and applications support. These are summarized below, and we invite you to contact us for complete technical information about our products and how they might help meet your current or future design requirements.



SIGNAL CONDITIONING AND DATA COMMUNICATIONS FROM DATAFORTH



Dataforth can provide complete solutions for any of your signal conditioning needs. Our products can be applied in the control room or distributed throughout the factory or process.

Isolated SCM5B Analog Signal Conditioning Modules

Dataforth Corporation, a Burr-Brown Company, offers cost-effective, isolated industrial signal conditioning modules. The SCM5B analog modules are form, fit, and functional equivalents to similar products from other manufacturers. The product line includes a complete selection of backpanel options, interface cables, racks, fuses, jumpers, power supplies, and other accessory items.

Improved SCM5B Analog Modules

Each SCM5B module provides a single channel of isolated analog input or output. Input modules interface to all types of external sensors. The modules filter, isolate, amplify, and convert the input signal to a high-level analog voltage output. The output modules accept a high-level analog voltage signal from a host system, then buffer, isolate, and amplify before providing a process current or voltage output to field devices. Over 100 different SCM5B modules are available encompassing a wide selection of isolated analog input and output functions. Analog inputs include voltage and current in narrow and wide bandwidths, Thermocouple, RTD, Potentiometer, Strain Gage, Frequency and 2-Wire Transmitter. Custom I/O ranges are also available. All modules are CSA approved for safe operation in Class I, Division 2, Groups A, B, C, and D hazardous environments.

Accessories include addressable and non-addressable single, dual, 8 and 16 channel backpanels which include on-board temperature sensors and cold junction thermocouple compensation; power supplies, mounting racks, interface cables, and evaluation boards.

Dataforth SCM5B modules offer several advantages when compared with competitive parts, while maintaining equivalent price:

• **50 times better** noise rejection by using a **6-pole filter** with 95dB NMR, versus a three-pole filter with 60dB NMR; • Lower output noise • True 3-way isolation • CMR of noise spikes measures **20dB better** than competing models.

Key Specifications

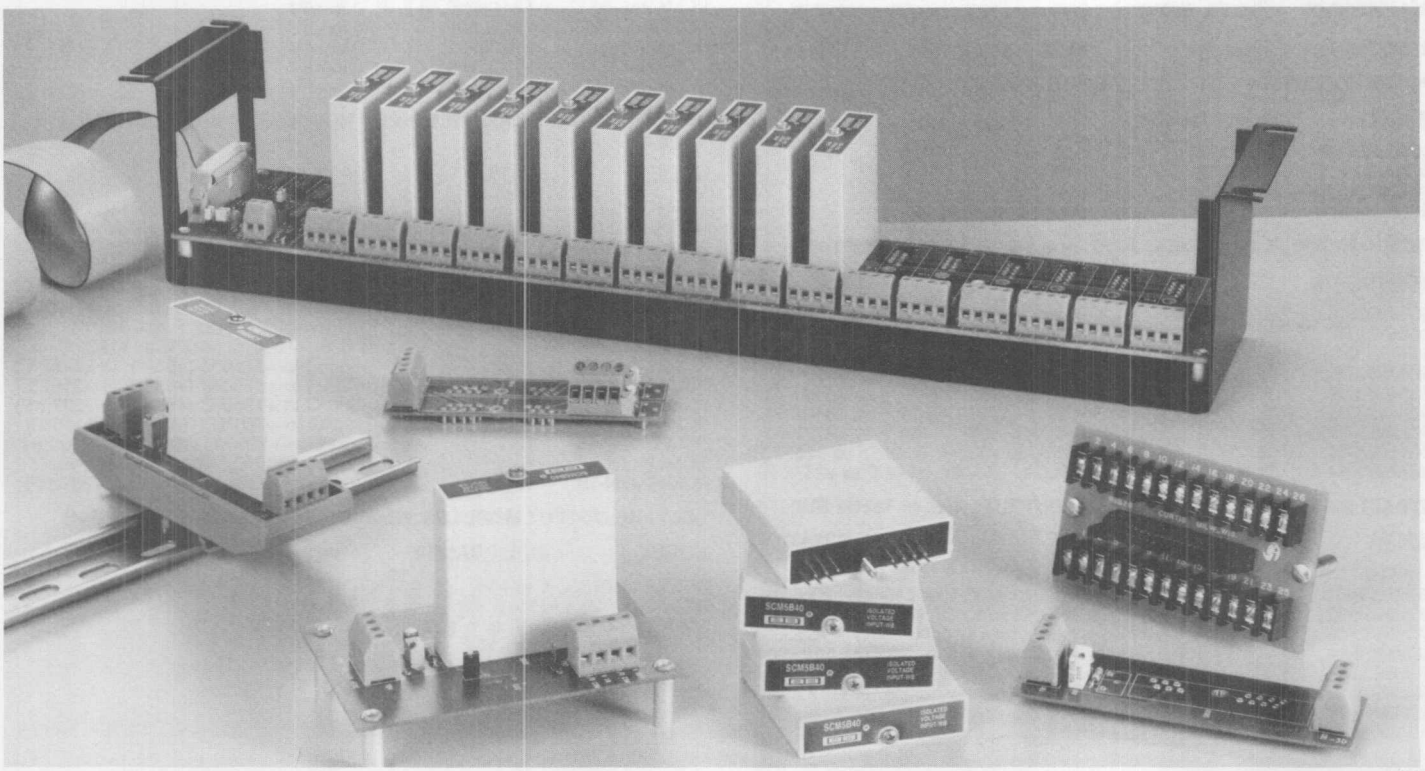
- 1500V Isolation
- Accuracy, 0.05%
- CMR, 160dB
- NMR, 95dB
- Transient Protection, ANSI/IEEE C37.90.1-1989
- ±1μV/°C Drift
- Output noise as low as 150μVrms
- 240VAC Protection for field I/O
- Operating temp range, –25°C/+85°C
- CSA CERTIFIED (Class I, Division 2, Groups A, B, C, D)

Applications

- DESIGNED FOR INDUSTRIAL PLANT ENVIRONMENTS
- PROTECTS USER EQUIPMENT FROM LIGHTNING AND HEAVY EQUIPMENT POWER-LINE VOLTAGE
- REDUCES ELECTRICAL NOISE IN MEASURED SIGNALS
- CONVENIENT SYSTEM EXPANSION AND REPAIR

Custom Signal Conditioning

Custom modules are available: consult factory for details on custom input ranges, output ranges, bandwidth, and other key parameters.



SELECTION GUIDE FOR SCM5B ISOLATED SIGNAL CONDITIONING PRODUCTS

ANALOG VOLTAGE INPUT MODULES, NARROW BANDWIDTH (4Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B30-01	±10mV	±5V
SCM5B30-02	±50mV	±5V
SCM5B30-03	±100mV	±5V
SCM5B30-04	±10mV	0 to +5V
SCM5B30-05	±50mV	0 to +5V
SCM5B30-06	±100mV	0 to +5V
SCM5B31-01	±1V	±5V
SCM5B31-02	±5V	±5V
SCM5B31-03	±10V	±5V
SCM5B31-04	±1V	0 to +5V
SCM5B31-05	±5V	0 to +5V
SCM5B31-06	±10V	0 to +5V
SCM5B31-07	±20V	±5V
SCM5B31-08	±20V	0 to +5V

ANALOG CURRENT INPUT MODULES, NARROW BANDWIDTH (4Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B32-01	4 to 20mA	0 to +5V
SCM5B32-02	0 to 20mA	0 to +5V

LINEARIZED 2- OR 3-WIRE RTD INPUT MODULES (0 to +5V OUTPUT*, 4Hz BW)

MODEL	TYPE***	INPUT RANGE
SCM5B34-01	100Ω Pt	–100°C to +100°C (–148°F to +212°F)
SCM5B34-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
SCM5B34-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
SCM5B34-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)
SCM5B34C-01	10Ω Cu at 0°C	0°C to +120°C (+32°F to +248°F)
SCM5B34C-02	10Ω Cu at 25°C	0°C to +120°C (+32°F to +248°F)
SCM5B34C-03	10Ω Cu at 0°	0°C to +160°C (+32°F to +320°F)
SCM5B34N-01	120Ω Ni	0°C to +300°C (+32°F to +572°F)

LINEARIZED 4-WIRE RTD INPUT MODULES (0 to +5V OUTPUT*, 4Hz BW)

MODEL	TYPE***	INPUT RANGE
SCM5B35-01	100Ω Pt	–100°C to +100°C (–148°F to +212°F)
SCM5B35-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
SCM5B35-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
SCM5B35-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)
SCM5B35C-01	10Ω Cu at 0°C	0°C to +120°C (+32°F to +248°F)
SCM5B35C-02	10Ω Cu at 25°C	0°C to +120°C (+32°F to +248°F)
SCM5B35C-03	10Ω Cu at 0°C	0°C to +160°C (+32°F to +320°F)
SCM5B35N-01	120Ω Ni	0°C to +300°C (+32°F to +572°F)

POTENTIOMETER INPUT MODULES (4Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B36-01	0 to 100Ω	0 to +5V
SCM5B36-02	0 to 500Ω	0 to +5V
SCM5B36-03	0 to 1KΩ	0 to +5V
SCM5B36-04	0 to 10KΩ	0 to +5V

THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT*, 4Hz BW)

MODEL	TYPE**	INPUT RANGE
SCM5B37J	J	–100°C to +760°C (–148°F to +1400°F)
SCM5B37K	K	–100°C to +1350°C (–148°F to +2462°F)
SCM5B37T	T	–100°C to +400°C (–148°F to +752°F)
SCM5B37E	E	0°C to +900°C (+32°F to +1652°F)
SCM5B37R	R	0°C to +1750°C (+32°F to +3182°F)
SCM5B37S	S	0°C to +1750°C (+32°F to +3182°F)
SCM5B37B	B	0°C to +1800°C (+32°F to +3272°F)
SCM5B37C	C	+350C to +1300C (+662˚F to +2372˚F)
SCM5B37N	N	-100C to +1300C (-148˚F to +2372˚F)

STRAIN GAGE INPUT MODULES (±5V OUTPUT*, 4Hz or 10kHz BW)

MODEL		INPUT	EXCITATION
10KHz	4Hz		
SCM5B38-01	-31	±10mV Full Bridge Input, (3mV/V) 100 to 10KΩ	3.333V
SCM5B38-02	-32	±30mV Full Bridge Input, (3mV/V) 300 to 10KΩ	10.000V
SCM5B38-03	-33	±10mV Half Bridge Input, (3mV/V) 100 to 10KΩ	3.333V
SCM5B38-04	-34	±30mV Half Bridge Input, (3mV/V) 300 to 10KΩ	10.000V
SCM5B38-05	-35	±20mV Full Bridge Input, (2mV/V) 300 to 10KΩ	10.000V
SCM5B38-06	-36	±33.3mV Full Bridge Input, (10mV/V) 100 to 10KΩ	3.333V
SCM5B38-07	-37	±100mV Full Bridge Input, (10mV/V) 300 to 10KΩ	10.000V

CURRENT OUTPUT MODULES (400Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B39-01	0 to +5V	4 to 20mA
SCM5B39-02	±5V	4 to 20mA
SCM5B39-03	0 to +5V	0 to 20mA
SCM5B39-04	±5V	0 to 20mA
SCM5B39-05	0 to 20mA	0 to 20mA

MATCHED PAIR SERVO/MOTOR CONTROLLER DRIVERS (1KHz BW)

MODEL	INPUT RANGE	INTERFACE	OUTPUT RANGE
SCM5B392-0111	0 to +5V	4 to 20mA	0 to +5V
SCM5B392-0212	±5V	4 to 20mA	±5V
SCM5B392-0313	0 to +10V	4 to 20mA	0 to +10V
SCM5B392-0414	±10V	4 to 20mA	±10V

ANALOG VOLTAGE INPUT MODULES, WIDE BANDWIDTH (10kHz BW)

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B40-01	±10mV	±5V
SCM5B40-02	±50mV	±5V
SCM5B40-03	±100mV	±5V
SCM5B40-04	±10mV	0 to +5V
SCM5B40-05	±50mV	0 to +5V
SCM5B40-06	±100mV	0 to +5V
SCM5B41-01	±1V	±5V
SCM5B41-02	±5V	±5V
SCM5B41-03	±10V	±5V
SCM5B41-04	±1V	0 to +5V
SCM5B41-05	±5V	0 to +5V
SCM5B41-06	±10V	0 to +5V
SCM5B41-07	±20V	±5V
SCM5B41-08	±20V	0 to +5V

2-WIRE TRANSMITTER INTERFACE MODULES (100Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B42-01	4 to 20mA	+1 to +5V
SCM5B42-02	4 to 20mA	+2 to +10V

FREQUENCY INPUT MODULES

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B45-01	0 to 500Hz	0 to +5V
SCM5B45-02	0 to 1kHz	0 to +5V
SCM5B45-03	0 to 3kHz	0 to +5V
SCM5B45-04	0 to 5kHz	0 to +5V
SCM5B45-05	0 to 10kHz	0 to +5V
SCM5B45-06	0 to 25kHz	0 to +5V
SCM5B45-07	0 to 50kHz	0 to +5V
SCM5B45-08	0 to 100kHz	0 to +5V
SCM5B45-09	0 to 250kHz	0 to +5V

LINEARIZED THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT*, 4Hz BW)

MODEL	TYPE**	INPUT RANGE
SCM5B47J-01	J	0°C to +760°C (+32°F to +1400°F)
SCM5B47J-02	J	–100°C to +300°C (–148°F to +572°F)
SCM5B47J-03	J	0°C to +500°C (+32°F to +932°F)
SCM5B47K-04	K	0°C to +1000°C (+32°F to +1832°F)
SCM5B47K-05	K	0°C to +500°C (+32°F to +932°F)
SCM5B47T-06	T	–100°C to +400°C (–148°F to +752°F)
SCM5B47T-07	T	0°C to +200°C (+32°F to +392°F)
SCM5B47E-08	E	0°C to +1000°C (+32°F to +1832°F)
SCM5B47R-09	R	+500°C to +1750°C (+932°F to +3182°F)
SCM5B47S-10	S	+500°C to +1750°C (+932°F to +3182°F)
SCM5B47B-11	B	+500°C to +1800°C (+932°F to +3272°F)
SCM5B47J-12	J	-100°C to +760°C (-148°F to +1400°F)
SCM5B47K-13	K	-100°C to +1350°C (-148°F to +2462°F)
SCM5B47K-14	K	0°C to +1200°C (+32°F to +2192°F)
SCM5B47N-15	N	-100°C to +1300°C (-148°F to +2372°F)

VOLTAGE OUTPUT MODULES, 50mA DRIVE CAPACITY (400 Hz BW)

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B49-01	0 to +5V	±5V
SCM5B49-02	±5V	±5V
SCM5B49-03	±5V	0 to +5V
SCM5B49-04	0 to +10V	±10V
SCM5B49-05	±10V	±10V
SCM5B49-06	±10V	0 to +10V

PRELIMINARY

SELECTION GUIDE FOR SCM5B ISOLATED SIGNAL CONDITIONING PRODUCTS

ACCESSORIES

MODEL	DESCRIPTION
SCMPB01	Non-multiplexed, 16 channel backpanel.
SCMPB02	Multiplexed, 16 channel backpanel.
SCMPB03	Single channel backpanel, DIN rail mount.
SCMPB04	Dual channel backpanel, DIN rail mount.
SCMPB05	Non-multiplexed, 8 channel backpanel
SCMPB06	Multiplexed, 8 channel backpanel
SCMXCA004-xx	System interface cable for both analog backpanels.
SCMXCA005	Daisy-chain cable for SCMPB02 backpanel.
SCMXIF	Ribbon cable to screw terminal interface board.
SCMXJP-003	Package of 10 jumpers.
SCMXFS-003	Package of 10, 4A fuses.
SCMXEV	Single channel SCM5B evaluation board.
SCMXRK-002	19 inch metal rack for mounting analog backpanels.
SCMXPRT-003	Power supply, 3A, 5VDC, 120VAC U.S.
SCMXPRE-003	Power supply, 3A, 5VDC, 220VAC European.
SCMXR1	Precision 20Ω resistor for SCM5B32 and SCM5B42.
SCMXCJC	Encapsulated cold junction compensation circuit
SCMXBEFE	Base element with snap foot
SCMXBE	Base element without snap foot
SCMXSE	Side element
SCMXVS	Connection pins
SCMXRAIL1	Gull wing style, perforated

***Note:**
Any module not shown with a 10V output can be specified with 10V output. Consult factory for ordering details and module specifications.

****THERMOCOUPLE ALLOY COMBINATIONS**

TYPE	MATERIAL
J	Iron vs. Copper-Nickel
K	Nickel-Chromium vs. Nickel-Aluminum
T	Copper vs. Copper-Nickel
E	Nickel-Chromium vs. Copper-Nickel
R	Platinum-13% Rhodium vs. Platinum
S	Platinum-10% Rhodium vs. Platinum
B	Platinum-30% Rhodium vs.Platinum-6%Rhodium
C	Tungsten-5% Rhenium vs. Tungsten-26% Rhenium
N	Nickel-14.2% Chromium-1.4% Silicon vs. Nickel-4.4% Silicon-0.1% Magnesium

*****RTD ALPHA COEFFICIENTS**

TYPE	ALPHA COEFFICIENT
100Ω Pt	0.00385
120Ω Ni	0.00672
10Ω Cu	0.004274

SCM5B30/31

Analog Voltage Input Modules, Narrow Bandwidth

FEATURES

- ACCEPTS MILLIVOLT AND VOLTAGE LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- ±1μV/°C DRIFT
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANELS

DESCRIPTION

Each SCM5B30 and SCM5B31 voltage input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B30 and SCM5B31 modules provides protection against accidental connection of power-line voltages up to 240VAC.

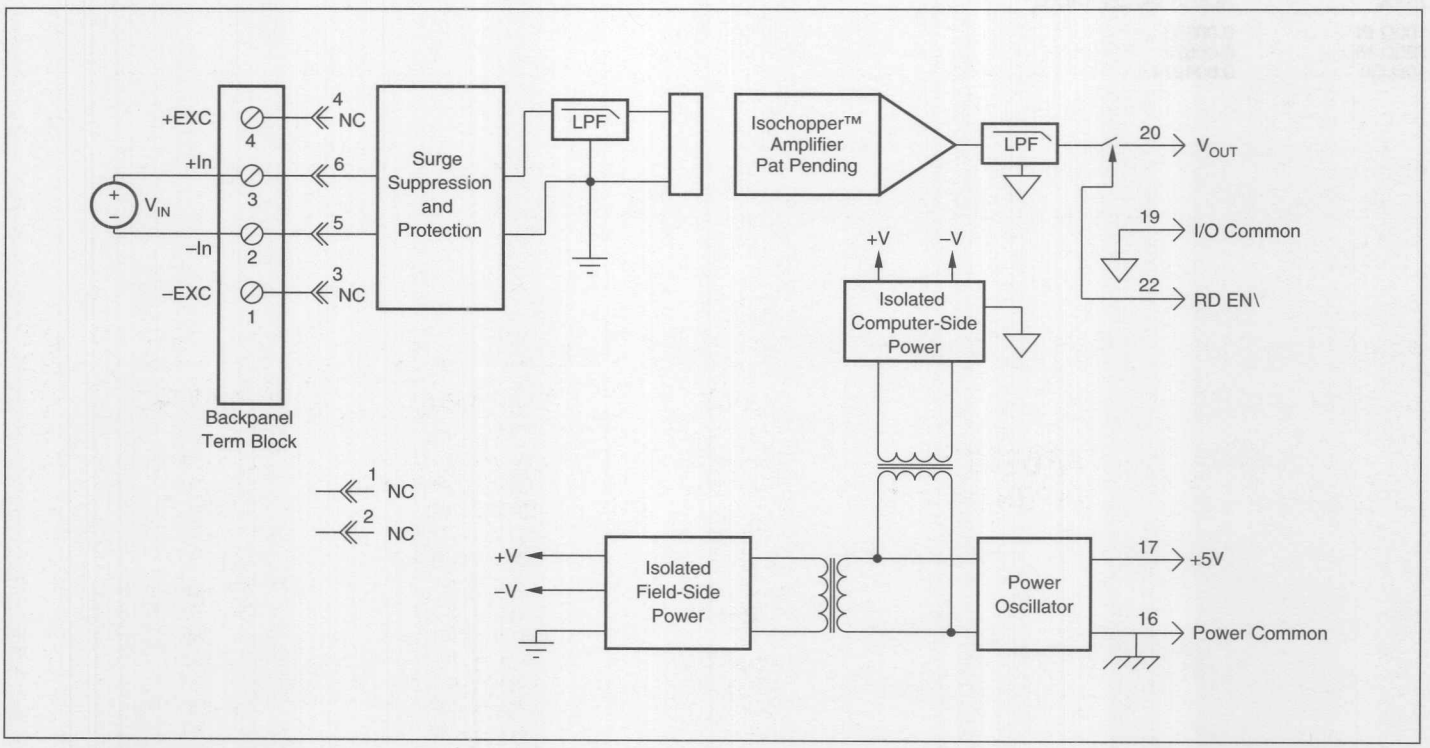


FIGURE 1. SCM5B30/31 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B30	SCM5B31
Input Range	±10mV to ±100mV	±1V to ±20V
Input Bias Current	±0.5nA	±0.05nA
Input Resistance		
Normal	50MΩ	650kΩ (minimum)
Power Off	40kΩ	650kΩ (minimum)
Overload	40kΩ	650kΩ (minimum)
Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50Hz or 60Hz)	160dB	*
NMR	95dB at 60Hz, 90dB at 50Hz	*
Accuracy[1]	±0.05% Span ±10µV RTI[2] ±0.05%(V_Z[3])	±0.05% Span ±0.2mV RTI[2] ±0.05%(V_Z[3])
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1µV/°C	±20µV/°C
Output Offset	±20µV/°C	*
Gain	±25ppm/°C	±50ppm/°C
Noise		
Input, 0.1 to 10Hz	0.2µVrms	2µVrms
Output, 100kHz	200µVrms	*
Bandwidth, –3dB	4Hz	*
Response Time, 90% Span	0.2s	*
Output Range†	±5V, 0V to +5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time	6µs at C_{load} = 0 to 2000pF	
(to ±1mV of V_{OUT})		*
Output Current Limit	±14mA max	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0", "1"	0.5µA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	30mA	*
Power Supply Sensitivity	±2µV/% RTI[2]	±200µV/% RTI[2]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temp. Range	–25°C to +85°C	*
Storage Temp. Range	–40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft	*

* Same specification as SCM5B30.
NOTES: (1) Includes nonlinearity, hysteresis and repeatability.
(2) RTI = Referenced to input.
(3) V_Z is the input voltage that results in 0V output.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†
SCM5B30-01	–10mV to +10mV	–5V to +5V
SCM5B30-02	–50mV to +50mV	–5V to +5V
SCM5B30-03	–100mV to +100mV	–5V to +5V
SCM5B30-04	–10mV to +10mV	0V to +5V
SCM5B30-05	–50mV to +50mV	0V to +5V
SCM5B30-06	–100mV to +100mV	0V to +5V
SCM5B31-01	–1V to +1V	–5V to +5V
SCM5B31-02	–5V to +5V	–5V to +5V
SCM5B31-03	–10V to +10V	–5V to +5V
SCM5B31-04	–1V to +1V	0V to +5V
SCM5B31-05	–5V to +5V	0V to +5V
SCM5B31-06	–10V to +10V	0V to +5V
SCM5B31-07††	–20V to +20V	–5V to +5V
SCM5B31-08††	–20V to +20V	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††CSA certification pending.

SCM5B32
Analog Current Input Modules

FEATURES

- ACCEPTS MILLIAMP LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB AT 50Hz
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANELS

DESCRIPTION

Each SCM5B32 current input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision 20Ω current conversion resistor is supplied with the SCM5B32 module. Sockets are provided on the SCMPB01/02/03/04/05/06 backpanels to allow installation of this resistor. Extra resistors are available under part number SCMXR1.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B32 modules provides protection against accidental connection of power-line voltages up to 240VAC.

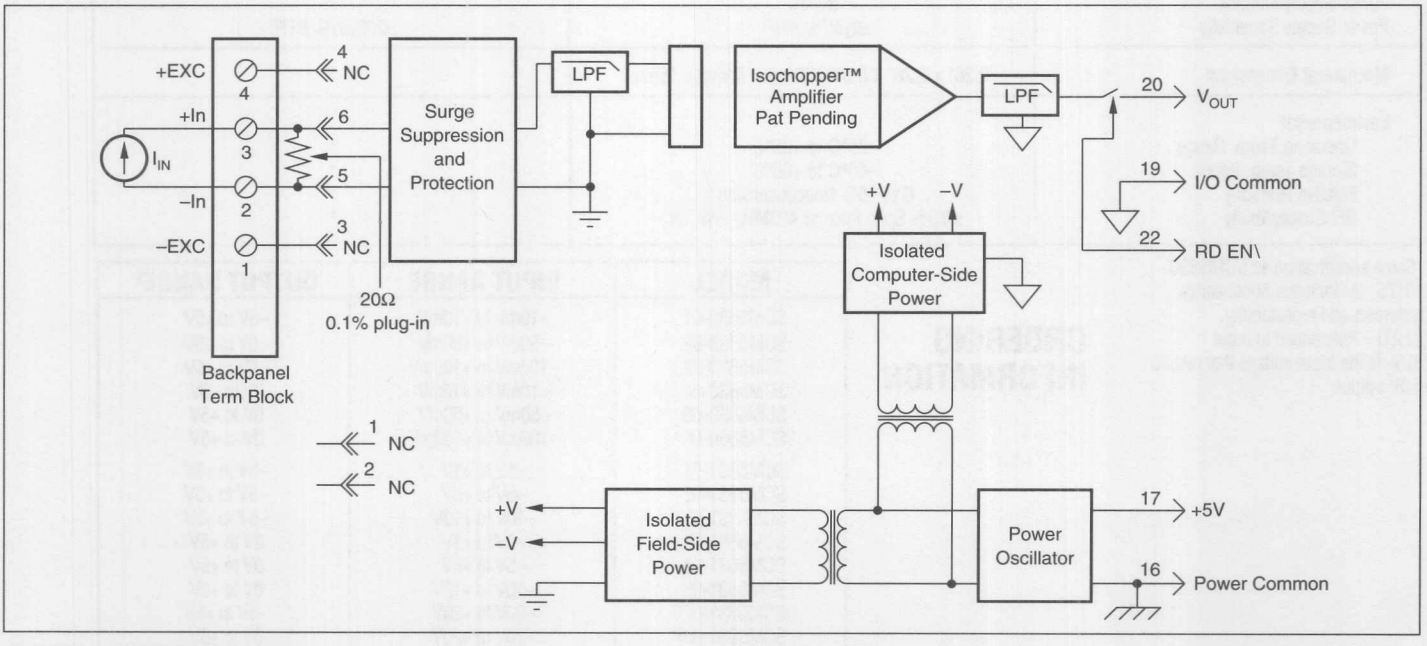


FIGURE 1. SCM5B32 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B32
Input Range	0mA to 20mA or 4mA to 20mA
Input Resistor	
Value	20.00Ω
Accuracy	±0.1%
Stability	±10ppm/°C
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy[1]	±0.05% span ±0.05% (I_Z [2])
Nonlinearity	±0.02% Span
Stability	
Input Offset	±50nA/°C
Output Offset	±20µV/°C
Gain	±25ppm/°C
Noise	
Input, 0.1Hz to 10Hz	10nArms
Output, 100kHz	200µVrms
Bandwidth, –3dB	4Hz
Response Time, 90% Span	0.2s
Output Range†	0 to +5V
Output Resistance	50Ω
Output Protection	Continuous Short to Gnd
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	±20µV/% RTI[3]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-25°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft

NOTE: (1) Includes nonlinearity, hysteresis and repeatability. (2) I_Z is the input current that results in 0V output. (3) RTI = Referenced to input.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†
SCM5B32-01	4mA to 20mA	0V to +5V
SCM5B32-02	0mA to 20mA	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.

SCM5B34
Linearized 2- or 3-Wire RTD Input Modules

FEATURES

- INTERFACES TO 100Ω PLATINUM, 10Ω COPPER, OR 120Ω NICKEL RTDs
- LINEARIZES RTD SIGNAL
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB AT 50Hz
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B34 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by two matched current sources. When using a three-wire RTD, this method allows an equal current to flow in each RTD lead, which cancels the effects of lead resistances. The excitation currents are very small (0.25mA for 100Ω Pt and 120Ω Ni, and 1.0mA for 10Ω Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B34 modules provides protection against accidental connection of power-line voltages up to 240VAC.

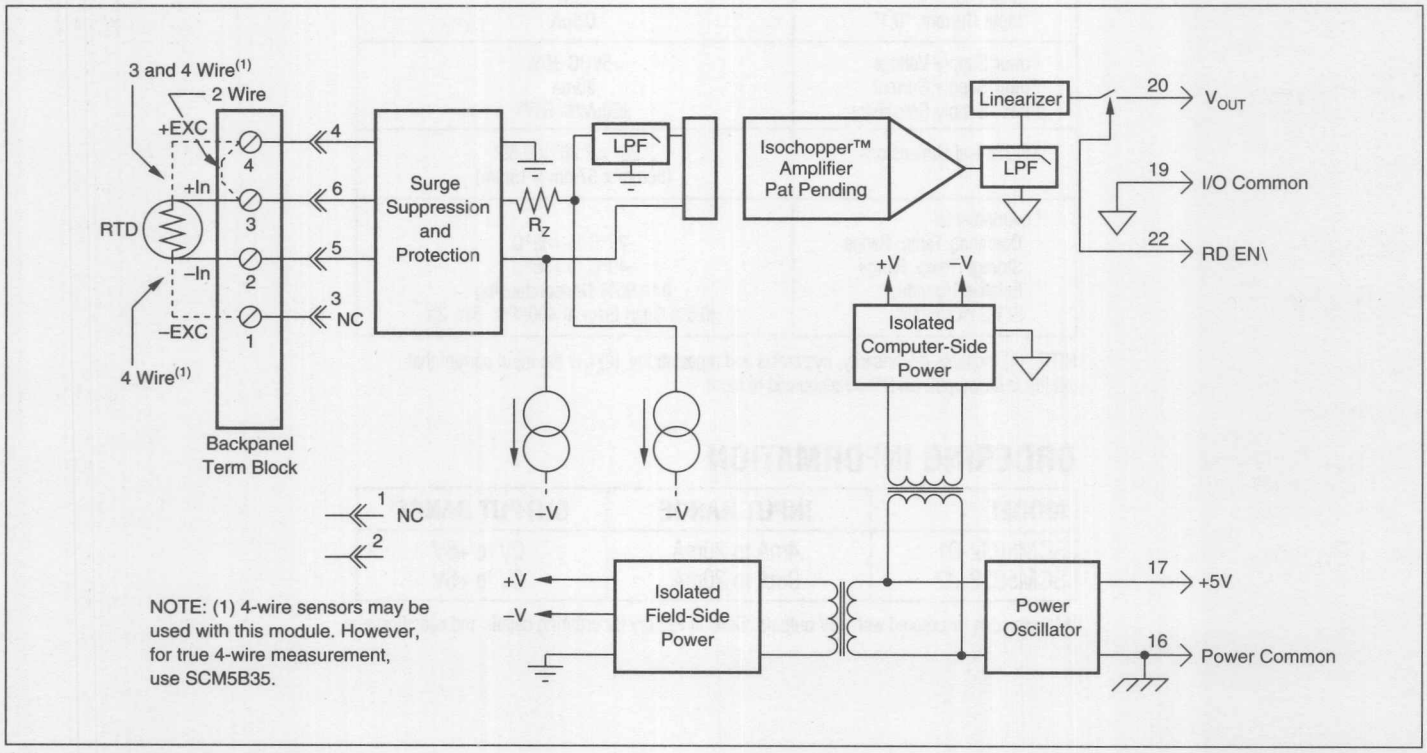
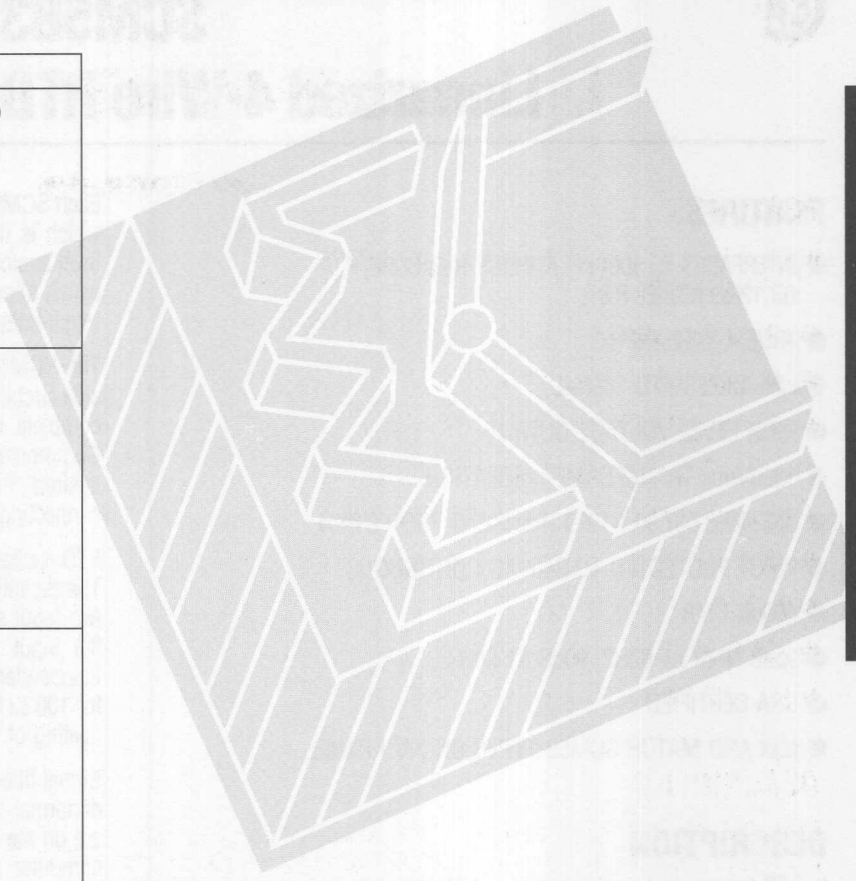


FIGURE 1. SCM5B34 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V Power.

Module	SCM5B34
Input Range Limits	–200°C to +850°C (100Ω Pt) –80°C to 320°C (120Ω Ni) –100°C to 260°C (10Ω Cu)
Input Resistance	
Normal	50MΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	
100Ω Pt, 120Ω Ni	0.25mA
10Ω Cu	1.0mA
Lead Resistance Effect	
100Ω Pt, 120Ω Ni	±0.02°C/Ω(1)
10Ω Cu	±0.2°C/Ω(1)
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Conformity Error	±0.05% Span
Stability	
Input Offset	±0.02°C/°C
Output Offset	±20µV/°C
Gain	±50ppm of reading/°C
Noise	
Input, 0.1 to 10Hz	0.2µVrms
Output, 100kHz	200µVrms
Bandwidth, –3dB	4Hz
Response Time, 90% Span	0.2s
Output Range†	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous Short to Ground
Output Selection Time	6µs at C_{load} = 0 to 2000pF
(to ±1mV of V_{OUT})	
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	
100Ω Pt, 120Ω Ni	0.2°C/V
10Ω Cu	0.5°C/V
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temperature Range	–25°C to +85°C
Storage Temperature Range	–40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft

NOTES: (1) "Ω" refers to the resistance in one lead.



ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†	ACCURACY††
100Ω Pt, α = 0.00385			
SCM5B34-01	–100°C to +100°C (–148°F to +212°F)	0V to +5V	±0.46°C
SCM5B34-02	0°C to +100°C (+32°F to 212°F)	0V to +5V	±0.36°C
SCM5B34-03	0°C to +200°C (+32°F to 392°F)	0V to +5V	±0.46°C
SCM5B34-04	0°C to +600°C (+32°F to 1112°F)	0V to +5V	±0.88°C
10Ω Cu, α = 0.004274			
SCM5B34C-01	0°C to +120°C (10Ω at 0°C) (+32°F to +248°F)	0V to +5V	±0.24°C
SCM5B34C-02	0°C to +120°C (10Ω at 25°C) (+32°F to +248°F)	0V to +5V	±0.24°C
SCM5B34C-03†††	0°C to +160°C (10Ω at 0°C) (+32°F to +320°F)	0V to +5V	±0.32°C
120Ω Ni, α = 0.00672			
SCM5B34N-01	0°C to +300°C (+32°F to +572°F)	0V to +5V	±0.40°C

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††Includes conformity, hysteresis and repeatability.
†††CSA certification pending.

SCM5B35
Linearized 4-Wire RTD Input Modules

FEATURES

- INTERFACES TO 100Ω PLATINUM, 10Ω COPPER, OR 120Ω NICKEL RTDs
- TRUE 4-WIRE INPUT
- LINEARIZES RTD SIGNAL
- HIGH LEVEL VOLTAGE OUTPUT
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60HZ, 90dB AT 50HZ
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

In RTD temperature measurement applications requiring a very high level of accuracy, the SCM5B35 4-Wire RTD input module offers a significant advantage over 3-wire measurement techniques (Figure 1). The SCM5B35 measures only the voltage dropped across the RTD and almost completely ignores the resistance or length of the RTD lead wires. The SCM5B34 3-Wire RTD module provides lead resistance compensation, but requires equal lead resistances, while the SCM5B35 does not require matched lead resistances.

Each SCM5B35 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by a precision current source. The excitation current is available on two leads which are separate from the two input signal measuring leads. The excitation current does not flow in the input signal leads, which allows RTD measurement to be totally independent of lead resistance. The excitation current is very small (0.25mA for 100 Ω Pt and 120 Ω Ni and 1.0 mA for 10Ω Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B35 modules provides protection against accidental connection of power-line voltages up to 240VAC.

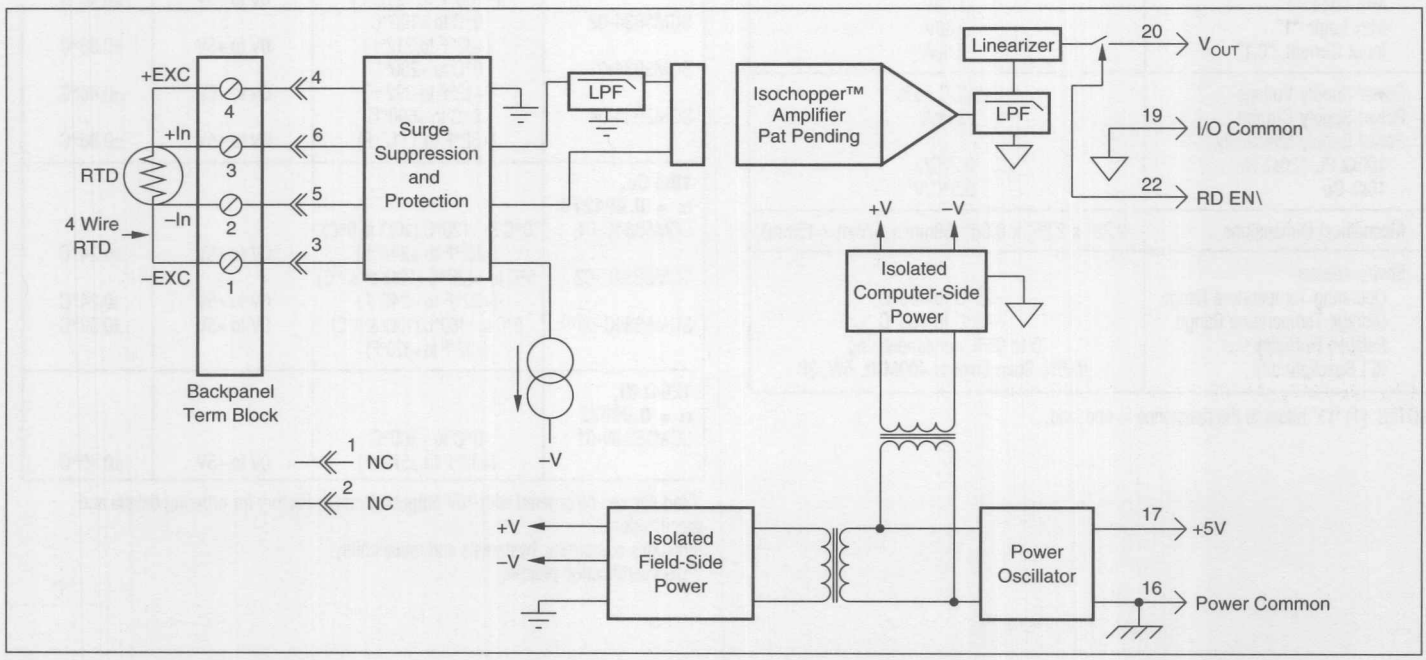


FIGURE 1. SCM5B35 Block Diagram.

SPECIFICATIONS

Typical at T_A = +25°C and +5V Power.

Module	SCM5B35
Input Range Limits	–200°C to +850°C (100Ω Pt) –80°C to +320°C (120Ω Ni) –100°C to +260°C (10Ω Cu)
Input Resistance	
Normal	50MΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	
100Ω Pt, 120Ω Ni	0.25mA
10Ω Cu	1.0mA
Lead Resistance Effect	
100Ω Pt, 120Ω Ni	±0.0005 °C/Ω[1]
10Ω Cu	±0.005 °C/Ω[1]
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Conformity Error	±0.05% Span
Stability	
Input Offset	±0.02°C/°C
Output Offset	±20µV/°C
Gain	±50ppm of reading/°C
Noise	
Input, 0.1 to 10Hz	0.2µVrms
Output, 100kHz	200µVrms
Bandwidth, –3dB	4Hz
Response Time, 90% span	0.2s
Output Range†	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous short to ground
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	
100Ω Pt, 120Ω Ni	±0.2°C/V
10Ω Cu	±0.5°C/V
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	–25°C to +85°C
Storage Temp. Range	–40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% Span error at 400MHz, 5W, 3ft

NOTES: (1) "Ω" refers to the resistance in one lead.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†	ACCURACY††
100 Ω Pt, α = 0.00385			
SCM5B35-01	–100°C to +100°C (–148°F to +212°F)	0V to +5V	±0.46°C
SCM5B35-02	0°C to +100°C (+32°F to 212°F)	0V to +5V	±0.36°C
SCM5B35-03	0°C to +200°C (+32°F to 392°F)	0V to +5V	±0.46°C
SCM5B35-04	0°C to +600°C (+32°F to 1112°F)	0V to +5V	±0.88°C
10 Ω Cu, α = 0.004274			
SCM5B35C-01	0°C to +120°C (10Ω at 0°C) (+32°F to +248°F)	0V to +5V	±0.24°C
SCM5B35C-02	0°C to +120°C (10Ω at 25°C) (+32°F to +248°F)	0V to +5V	±0.24°C
SCM5B35C-03†††	0°C to +160°C (10Ω at 0°C) (+32°F to +320°F)	0V to +5V	±0.32°C
120 Ω Ni, α = 0.00672			
SCM5B35N-01	0°C to +300°C (+32°F to +572°F)	0V to +5V	±0.40°C

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††Includes conformity, hysteresis and repeatability.
†††CSA certification pending.

SCM5B36

Potentiometer Input Modules

FEATURES

- INTERFACES TO POTENTIOMETERS UP TO 10,000 OHMS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60HZ, 90dB AT 50HZ
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFICATION PENDING

DESCRIPTION

Each SCM5B36 Potentiometer input module provides a single channel of Potentiometer input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ± 50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Excitation for the potentiometer is provided from the module by two matched current sources. When using a three-wire potentiometer, this method allows cancellation of the effects of lead resistances. The excitation currents are very small (less than 1.0mA) which minimizes self-heating of the potentiometer.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are in the output stage. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B36 module provides protection against accidental connection of power-line voltages up to 240VAC.

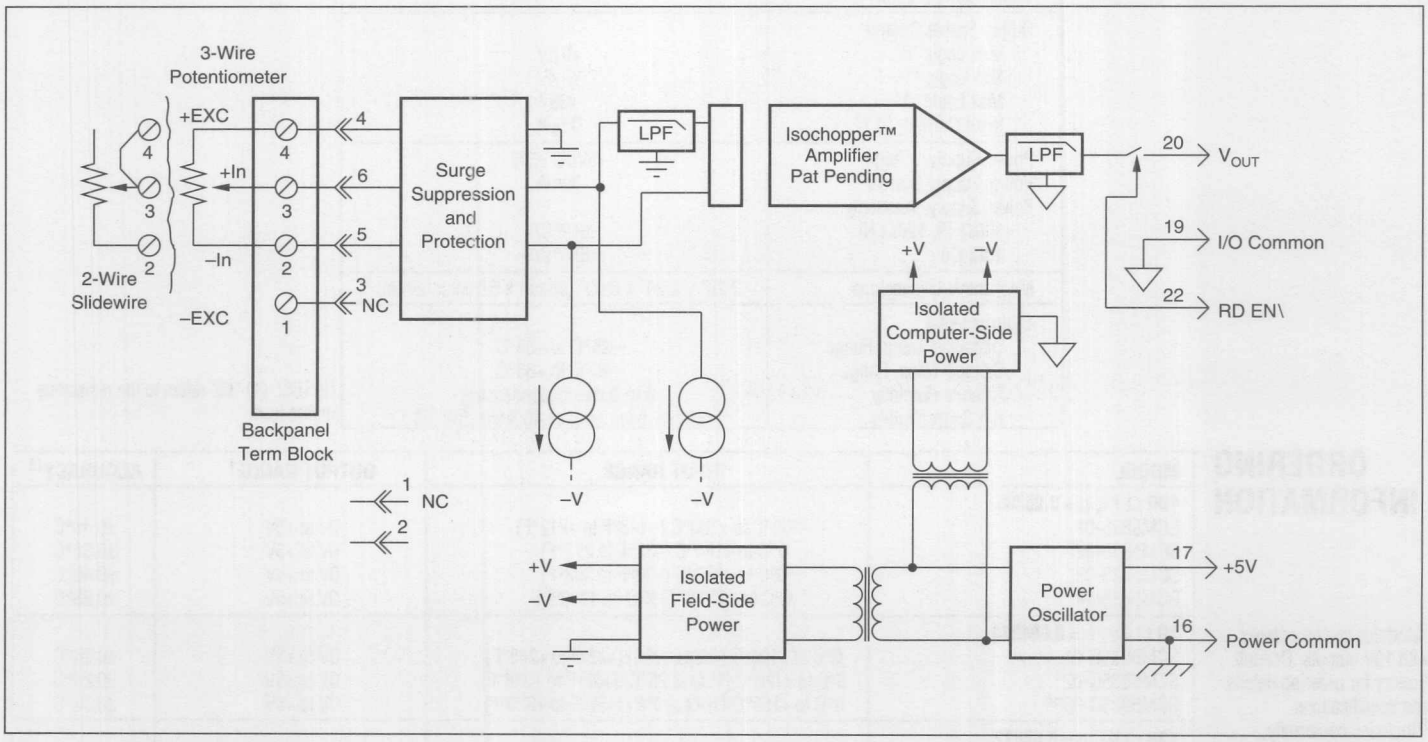


FIGURE 1. SCM5B36 Block Diagram.

SPECIFICATIONS

Typical at Ta = +25°C and +5V Power

Module	SCM5B36
Input Range	0 to 10KΩ
Input Resistance	
Normal	50MΩ
Power Off	40KΩ
Overload	40KΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	0.25mA; 100Ω, 500Ω, 1KΩ sensor 0.10mA; 10KΩ sensor
Lead Resistance Effect	±1.5µV/Ω RTI[1]
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	160dB
NMR	95dB @ 60Hz, 90dB @ 50Hz
Accuracy[2]	±0.08% Span
Stability	
Input Offset	±1µV/°C
Output Offset	±20µV/°C
Gain	±50ppm of reading/°C
Noise	
Input, 0.1 to 10Hz	0.2µVrms RTI[1]
Output, 100KHz	200µVrms RTO[3]
Bandwidth, -3dB	4Hz
Response Time, 90% span	0.2s
Output Range†	0 to +5V
Output Resistance	50Ω
Output Protection	Continuous short to ground
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	±2µV/% RTI[1]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-25°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% Span error @ 400MHz, 5W, 3ft

NOTES: (1) Referenced to input. (2) Includes nonlinearity, hysteresis and repeatability.
(3) Referenced to output.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†
SCM5B36-01	0 to 100Ω	0V to +5V
SCM5B36-02	0 to 500Ω	0V to +5V
SCM5B36-03	0 to 1KΩ	0V to +5V
SCM5B36-04	0 to 10KΩ	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.

SCM5B37
Thermocouple Input Modules

FEATURES

- INTERFACES TO TYPES J, K, T, E, R, S, C, N AND B THERMOCOUPLES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- ±1µV/°C DRIFT
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B37 thermocouple input module provides a single channel of thermocouple input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B37 can interface to nine industry standard thermocouple types: J, K, T, E, R, S, C, N, and B. Its corresponding output signal operates over a 0V to +5V range. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting backpanel. Upscale open thermocouple detect is provided by an internal pull-up resistor. Downscale indication can be implemented by installing an external 47MΩ resistor, ±20% tolerance, between screw terminals 1 and 3 on the SCMPB01/02/03/04/05/06 backpanels.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B37 modules provides protection against accidental connection of power-line voltages up to 240VAC.

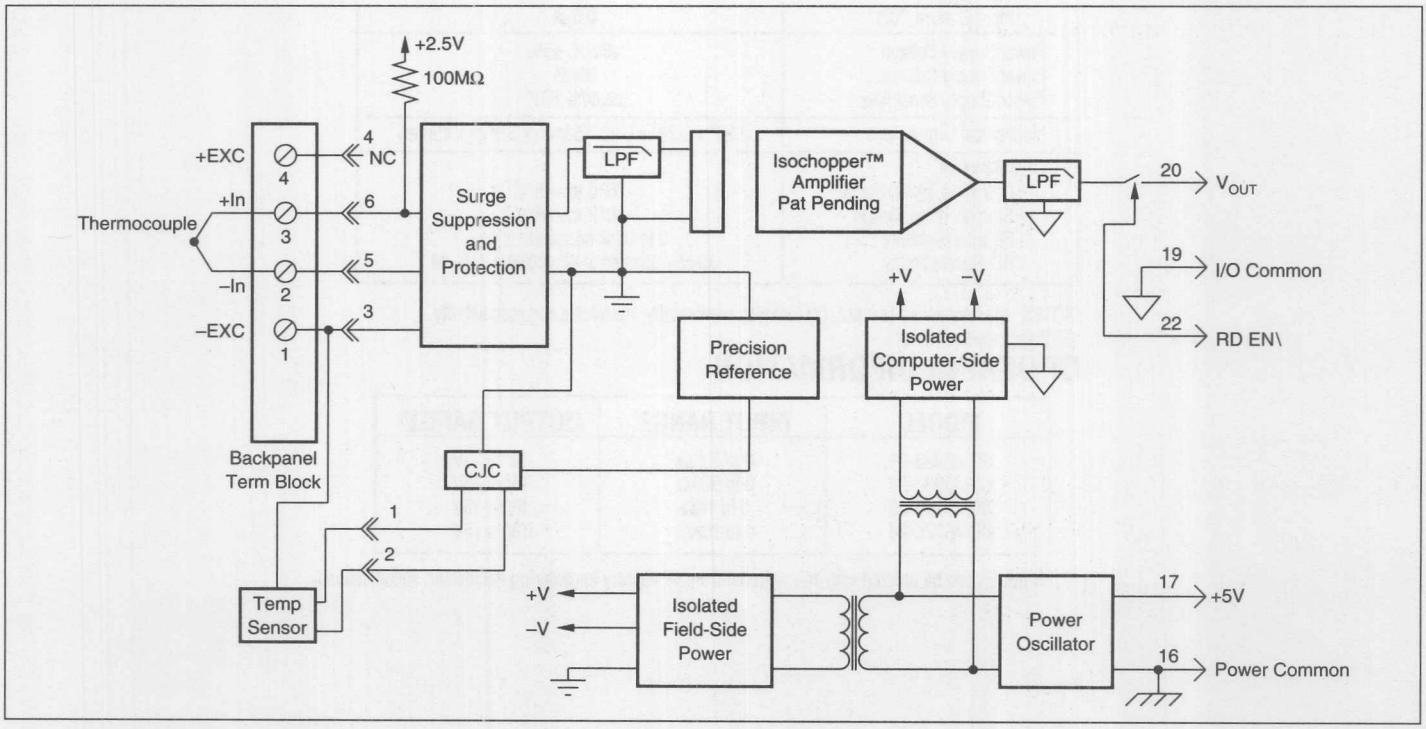


FIGURE 1. SCM5B37 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B37
Input Range	-0.1V to +0.5V
Input Bias Current	-25nA
Input Resistance	
Normal	50MΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy[1]	±0.05% Span ±10µV RTI[2]
Nonlinearity	±0.02% Span
Stability	
Input Offset	±1µV/°C[3]
Output Offset	±20µV/°C
Gain	±25ppm/°C
Noise	
Input, 0.1 to 10Hz	0.2µVrms
Output, 100kHz	200µVrms
Bandwidth, –3dB	4Hz
Response Time, 90% Span	0.2s
Output Range†	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous Short to Ground
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0", "1"	0.5µA
Open Input Response	Upscale
Open Input Detection Time	10s
Cold Junction Compensation	
Accuracy, 25°C	±0.25°C
Accuracy, +5°C to +45°C	±0.5°C
Accuracy, –25°C to +85°C	±1.0°C
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	±2µV/% RTI[2]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	–25°C to +85°C
Storage Temp. Range	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft

NOTES: (1) Includes nonlinearity, hysteresis and repeatability. Does not include CJC accuracy. (2) RTI = Referenced to input. (3)This is equivalent to °C as follows: Type J 0.020 °C/°C, Types K, T 0.025°C/°C, Type E 0.016°C/°C, Types R, S 0.168°C/°C. Type N 0.037°C/°C, Type C, 0.072°C/°C.

ORDERING INFORMATION

MODEL	TYPE	INPUT RANGE	OUTPUT RANGE†
SCM5B37J	Type J	–100°C to +760°C (–148°F to +1400°F)	0V to +5V
SCM5B37K	Type K	–100°C to +1350°C (–148°F to +2462°F)	0V to +5V
SCM5B37T	Type T	–100°C to +400°C (–148°F to +752°F)	0V to +5V
SCM5B37E	Type E	0°C to +900°C (+32°F to +1652°F)	0V to +5V
SCM5B37R	Type R	0°C to +1750°C (+32°F to +3182°F)	0V to +5V
SCM5B37S	Type S	0°C to +1750°C (+32°F to +3182°F)	0V to +5V
SCM5B37B	Type B	0°C to +1800°C (+32°F to +3272°F)	0V to +5V
SCM5B37C††	Type C	+350°C to +1300°C (+662°F to +2372°F)	0V to +5V
SCM5B37N††	Type N	–100°C to +1300°C (–148°F to +2372°F)	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††CSA certification pending.

SCM5B38
Strain Gage Input Modules, Narrow Bandwidth

FEATURES

- INTERFACES TO 100Ω THRU 10kΩ, FULL-BRIDGE, HALF-BRIDGE, OR QUARTER-BRIDGE STRAIN GAGES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- FULLY ISOLATED EXCITATION SUPPLY
- 160dB CMR
- 4Hz SIGNAL BANDWIDTH
- ±0.08% ACCURACY
- ±0.02% LINEARITY
- ±1μV/°C DRIFT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFICATION PENDING

DESCRIPTION

Each SCM5B38 Strain Gage input module provides a single channel of Strain Gage input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B38 can interface to full-bridge or half-bridge transducers with a nominal resistance of 100Ω to 10kΩ. A matched pair of bridge-completion resistors (to ±1mV at +10V excitation) allows use of low cost half-bridge or quarter-bridge transducers (Figures 2, 3, 4).

Strain Gage excitation is provided from the module by a very stable 10V or 3.333V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Full scale sensitivities of 2mV/V, 3mV/V or 10mV/V are offered as standard. With 10V excitation, this results in ±20mV, ±30mV or ±100mV full scale input range producing ±5V full scale output.

After initial field side filtering the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

Special input circuits on the SCM5B38 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

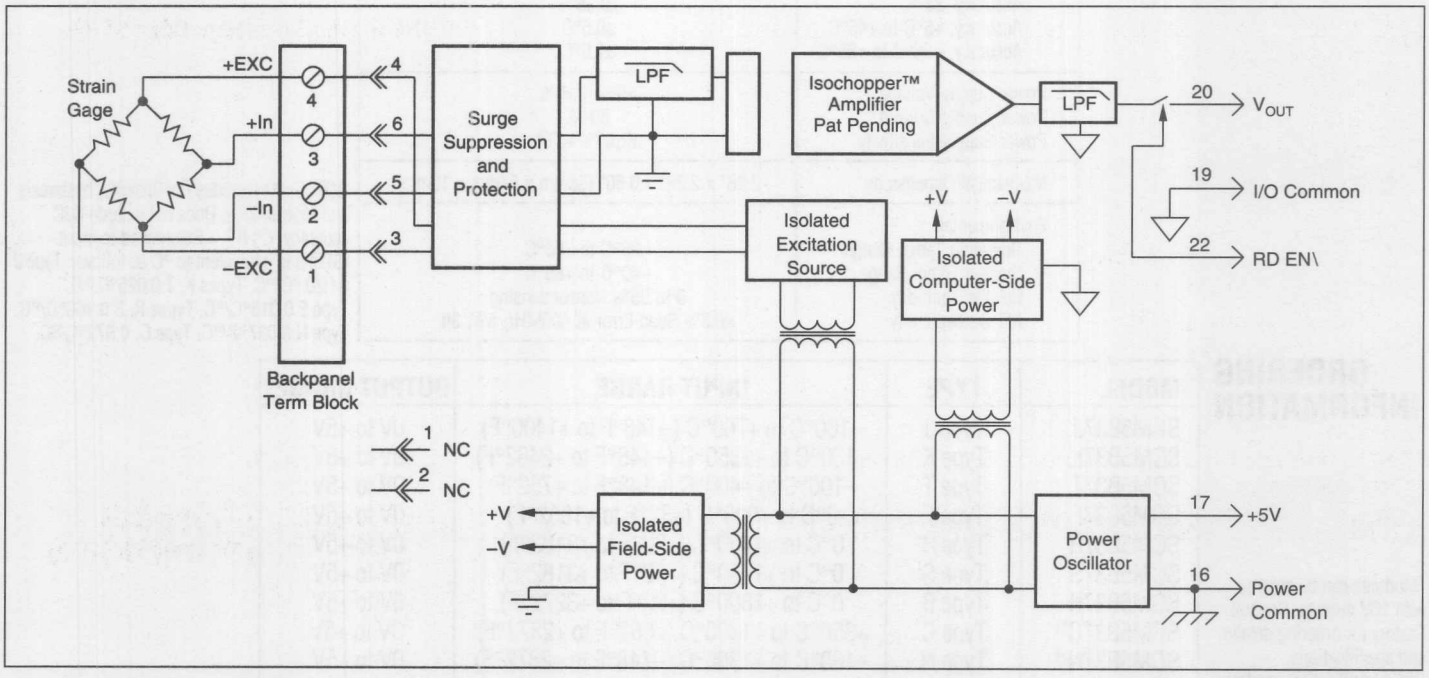


FIGURE 1. SCM5B38 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	Full Bridge SCM5B38-31, -32, -35, -36, -37	Half Bridge SCM5B38-33, -34
Input Range	±10mV to ±30mV	*
Input Bias Current	±0.5nA	*
Input Resistance		
Normal	50MΩ	*
Power Off	40kΩ	*
Overload	40kΩ	*
Signal Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
Excitation Output (-32, -34, -35, -37)	+10V ±3mV	*
Excitation Output (-31, -33, -36)	+3.333V ±2mV	*
Excitation Load Regulation	±5ppm/mA	*
Excitation Stability	±15ppm/°C	*
Half Bridge Voltage Level (-34)	NA	+5V ±1mV
Half Bridge Voltage Level (-33)	NA	+1.667V ±1mV
Isolated Excitation Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50 or 60Hz)	160dB	*
NMR	95dB at 60Hz, 90dB at 50Hz	*
Accuracy[2]	±0.08% Span ±10µV RTI[3]	*
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1µV/°C	*
Output Offset	±20µV/°C	*
Gain	±25ppm of Reading/°C	*
Noise		
Input, 0.1 to 10Hz	0.2µVrms	1µVrms
Output, 100kHz	200µVrms	*
Bandwidth, –3dB	4Hz	*
Response Time, 90% span	0.2s	*
Output Range†	±5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF	
Output Current Limit	±14mA max	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0,1"	0.5µA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	170mA Full Load, 70mA No Load	*
Power Supply Sensitivity	±2µV/% RTI[3]	*
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temperature Range	–25°C to +85°C	*
Storage Temperature Range	–40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3 ft	*

* Same as -31, -32, -35, -36, -37 modules.

NOTES: (1) Strain element. (2) Includes excitation error, nonlinearity, hysteresis and repeatability.
(3) Referenced to input.

FIGURE 2. Full Bridge Connection.

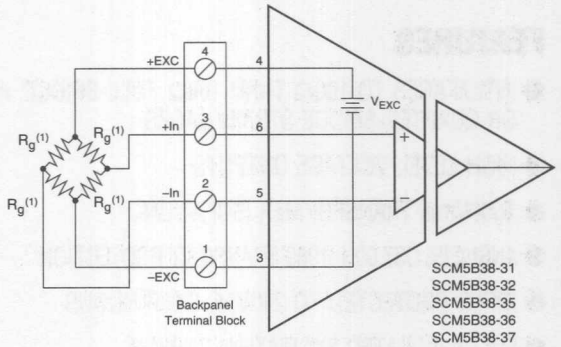


FIGURE 3. Half Bridge Connection.

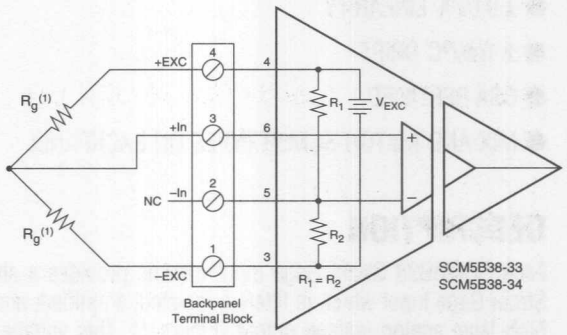
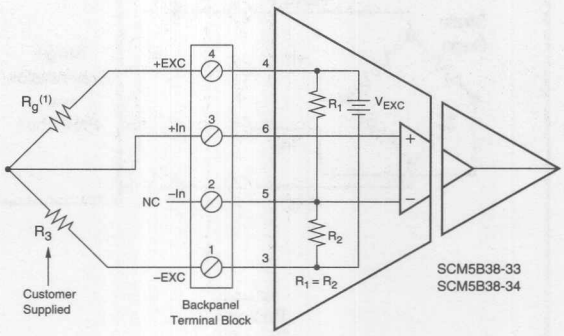


FIGURE 4. Quarter Bridge Connection.



ORDERING INFORMATION

MODEL	INPUT BRIDGE TYPE	INPUT RANGE	EXCITATION	OUTPUT RANGE†
SCM5B38-31	Full Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-32	Full Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-33	Half Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-34	Half Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-35	Full Bridge	300Ω to 10kΩ	10.0V at 2mV/V Sensitivity	–5V to +5V
SCM5B38-36	Full Bridge	100Ω to 10kΩ	3.333V at 10mV/V Sensitivity	–5V to +5V
SCM5B38-37	Full Bridge	300Ω to 10kΩ	10.0V at 10mV/V Sensitivity	–5V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.

SCM5B38

Strain Gage Input Modules, Wide Bandwidth

FEATURES

- INTERFACES TO 100Ω THRU 10kΩ, FULL-BRIDGE, HALF-BRIDGE, OR QUARTER-BRIDGE STRAIN GAGES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- FULLY ISOLATED EXCITATION SUPPLY
- 100dB CMR
- 10kHz SIGNAL BANDWIDTH
- ±0.08% ACCURACY
- ±0.02% LINEARITY
- ±1μV/°C DRIFT
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B38 Strain Gage input module provides a single channel of Strain Gage input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B38 can interface to full-bridge or half-bridge transducers with a nominal resistance of 100Ω to 10kΩ. A matched pair of bridge-completion resistors (to ±1mV at +10V excitation) allows use of low cost half-bridge or quarter-bridge transducers (Figures 2, 3, 4). The 10kHz bandwidth allows measurement of high speed processes such as vibration analysis.

Strain Gage excitation is provided from the module by a very stable 10V or 3.333V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Full scale sensitivities of 2mV/V, 3mV/V or 10mV/V are offered as standard. With 10V excitation, this results in ±20mV, ±30mV or ±100mV full scale input range producing ±5V full scale output.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

Special input circuits on the SCM5B38 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

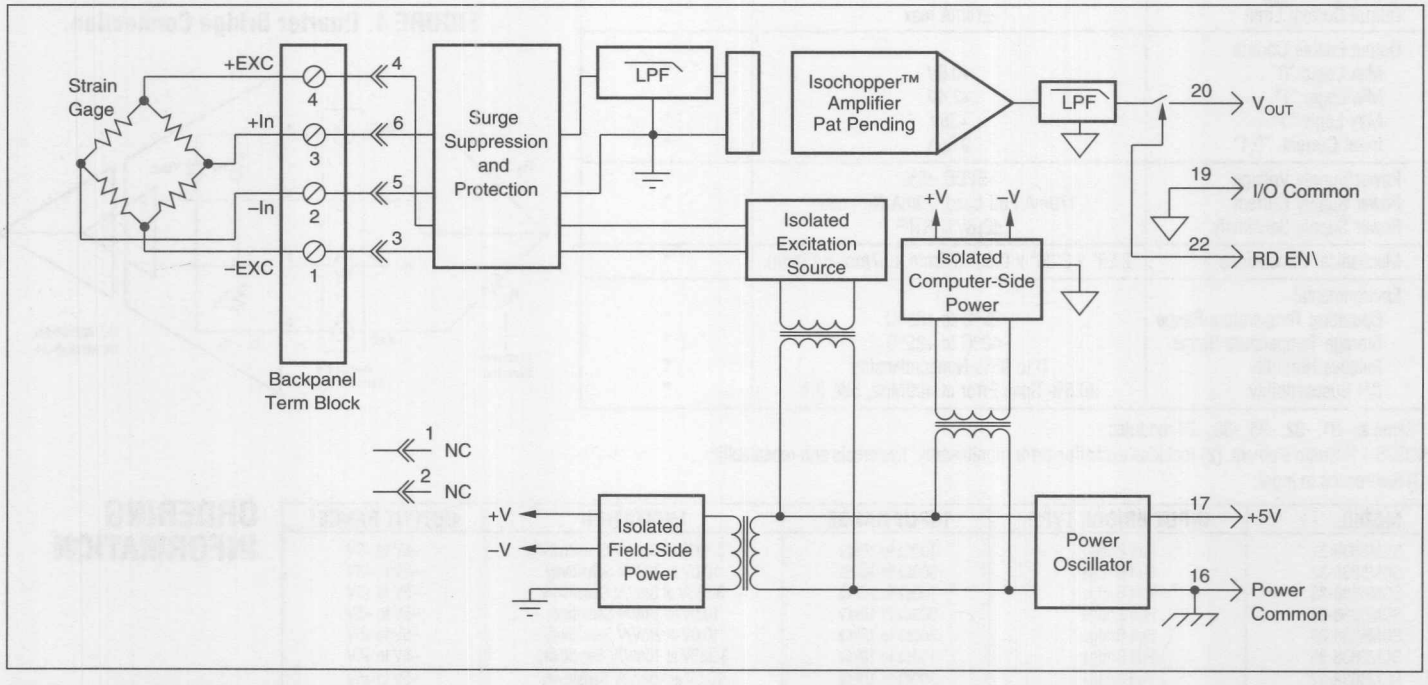


FIGURE 1. SCM5B38 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	Full Bridge SCM5B38-31, -02, -05, -06, -07	Half Bridge SCM5B38-33, -34
Input Range	±10mV to ±100mV	*
Input Bias Current	±0.3nA	*
Input Resistance		
Normal	50MΩ	*
Power Off	40kΩ	*
Overload	40kΩ	*
Signal Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
Excitation Output (-02, -04, -05, -07)	+10V ±3mV	*
Excitation Output (-01, -03, -06)	+3.333V ±2mV	*
Excitation Load Regulation	±5ppm/mA	*
Excitation Stability	±15ppm/°C	*
Half Bridge Voltage Level (-04)	NA	+5V ±1mV
Half Bridge Voltage Level (-03)	NA	+1.667V ±1mV
Isolated Excitation Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50 or 60Hz)	100dB	*
NMR (–3dB at 10kHz)	120dB per Decade above 10kHz	*
Accuracy[2]	±0.08% Span ±10µV RTI[3]	*
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1µV/°C	*
Output Offset	±40µV/°C	*
Gain	±25ppm of Reading/°C	*
Noise		
Input, 0.1 to 10Hz	0.4µVrms	2µVrms
Output, 100kHz	10µVp-p	*
Bandwidth, –3dB	10kHz	*
Rise Time, 10 to 90% span	40µs	*
Setting Time, to 0.1%	250µs	*
Output Range†	±5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF	*
Output Current Limit	±20mA max	
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0,1"	0.5µA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	170mA Full Load, 70mA No Load	*
Power Supply Sensitivity	±2µV/% RTI[3]	*
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temperature Range	–25°C to +85°C	*
Storage Temperature Range	–40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3 ft	*

* Same as –01, –02, –05, –06, –07 modules.

NOTES: (1) Strain element. (2) Includes excitation error, nonlinearity, hysteresis and repeatability. (3) Referenced to input.

FIGURE 2. Full Bridge Connection.

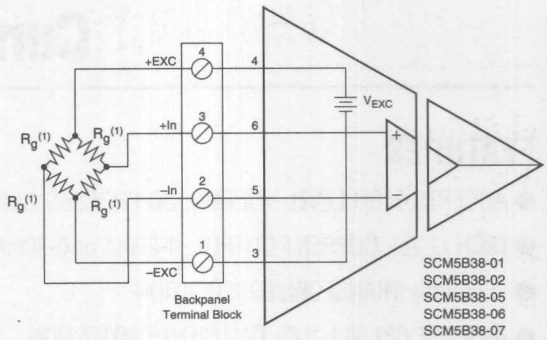


FIGURE 3. Half Bridge Connection.

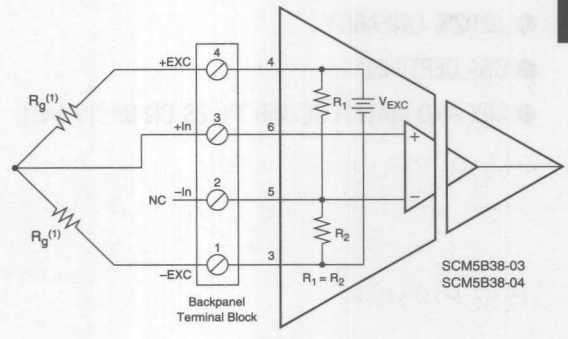
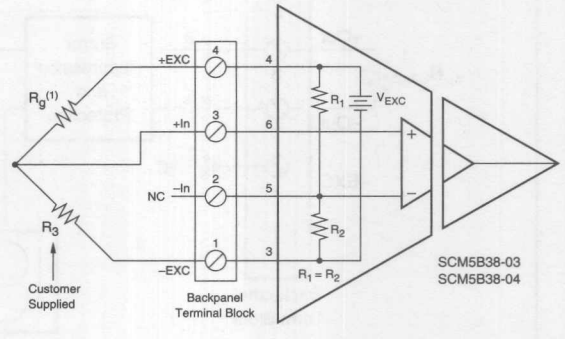


FIGURE 4. Quarter Bridge Connection.



ORDERING INFORMATION

MODEL (10kHz)	INPUT BRIDGE TYPE	INPUT RANGE	EXCITATION	OUTPUT RANGE†
SCM5B38-01	Full Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-02	Full Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-03	Half Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-04	Half Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	–5V to +5V
SCM5B38-05	Full Bridge	300Ω to 10kΩ	10.0V at 2mV/V Sensitivity	–5V to +5V
SCM5B38-06††	Full Bridge	100Ω to 10kΩ	3.333V at 10mV/V Sensitivity	–5V to +5V
SCM5B38-07††	Full Bridge	300Ω to 10kΩ	10.0V at 10mV/V Sensitivity	–5V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.

††CSA certification pending.

SCM5B39
Current Output Modules

FEATURES

- ACCEPTS HIGH LEVEL VOLTAGE OR PROCESS CURRENT INPUT
- HIGH LEVEL CURRENT OUTPUT: 4-20mA or 0-20mA
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- OUTPUT PROTECTED TO 240VAC CONTINUOUS
- 110dB CMR
- 400Hz SIGNAL BANDWIDTH
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B39 current output module provides a single channel of analog output. The track-and-hold circuit in the input stage can be operated in a hold mode where one DAC can supply many output modules, or a track mode where one DAC is dedicated to each module. In addition to the track-and-hold circuit, each module provides signal buffering, isolation, filtering, and conversion to a high level current output (Figure 1).

Setting of the track or hold mode is controlled by the logic state of WR EN\, module pin 23. When pin 23 is low, the track mode is enabled. If pin 23 is open or high, the hold mode is enabled. The module is designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the track and hold circuit. For a low state, simply connect pin 23, the Write-Enable pin to I/O Common, pin 19.

The SCMPB02 and SCMPB06 backpanels allow host computer control of the WR EN\ control line, which allows multiplexing of one host DAC to up to 64 SCM5B39 output modules. During power-up, the output remains at 0mA for 100ms, which allows the track-and-hold circuit to be initialized.

A special circuit in the output stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.

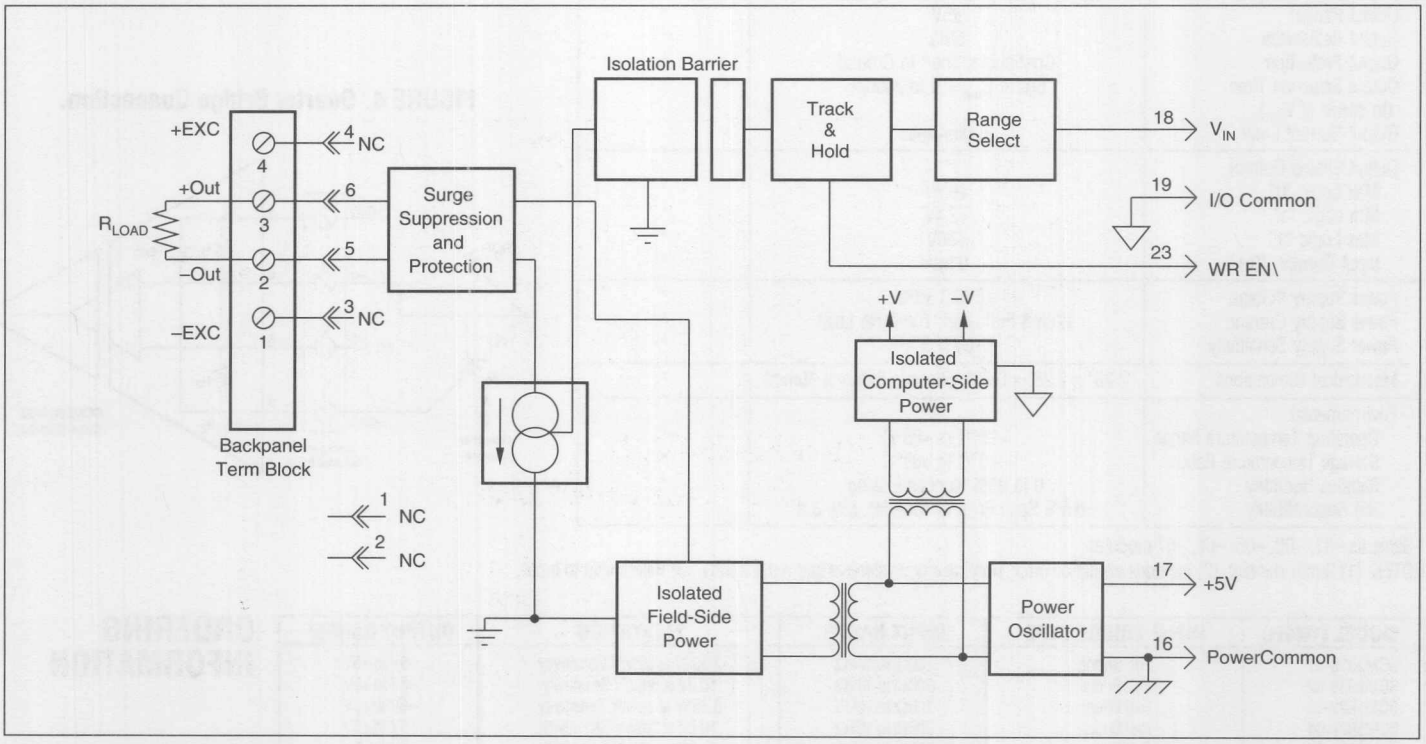


FIGURE 1. SCM5B39 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B39
Input Voltage Range	±5V or 0V to +5V
Input Current Range (–05)	0 to 20mA
Input Voltage Maximum	±36V (no damage)
Input Current, Maximum (–05)	75mA (no damage)
Input Resistance	50MΩ
Input Resistance (–05)	20Ω
Output Current Range	0 to 20mA or 4 to 20mA
Over Range Capability	10%
Output Compliance Voltage	
(Open Circuit)	22VDC
Load Resistance Range	0 to 650Ω
	(0 to 750Ω for Power Supply Voltage greater than 4.95VDC)
Output I Under Fault, max	26mA
Output Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Output to Input	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	110dB
NMR (–3dB at 400 Hz)	40dB per Decade above 400Hz
Accuracy	±0.05% Span
Nonlinearity	±0.02% Span
Stability	
Zero	±0.5µA/°C
Span	±20ppm/°C
Noise	
Output Ripple, 1kHz bandwidth	10µAp-p
Bandwidth, –3dB	400Hz
Rise Time, 10 to 90% Span	0.75ms
Sample and Hold	
Output Droop Rate	40µA/s
Acquisition Time	50µs
Track-and-Hold Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	170mA
Power Supply Sensitivity	±0.5µA/%
Mechanical Dimensions	2.28" x 2.26" x 0.6" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	–25°C to +85°C
Storage Temp. Range	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B39-01	0V to +5V	4mA to 20mA
SCM5B39-02	–5V to +5V	4mA to 20mA
SCM5B39-03	0V to +5V	0mA to 20mA
SCM5B39-04	–5V to +5V	0mA to 20mA
SCM5B39-05†	0mA to 20mA	0mA to 20mA

†CSA certification pending

SCM5B392
Matched-Pair Servo/Motor Controller Modules

FEATURES

- EXTENDS THE DISTANCE AND ISOLATES SERVO/MOTOR CONTROLLER SIGNALS
- PROVIDES ISOLATED CURRENT LOOP INTERFACE BETWEEN CONTROLLER AND MOTOR OR ACTUATOR
- ACCEPTS HIGH LEVEL VOLTAGE INPUTS UP TO ±10V
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS UP TO ±10V
- 1500 VOLT TRANSFORMER ISOLATION (3000V TOTAL LOOP)
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- CURRENT LOOP IS PROTECTED TO 240VAC CONTINUOUS
- 1kHz SIGNAL BANDWIDTH
- 110dB CMR
- ±0.1% ACCURACY
- ±0.04% LINEARITY
- CSA CERTIFICATION PENDING

DESCRIPTION

The SCM5B392 servo/motor controller module set is designed to solve the problem of extending a servo or motor controller signal a long distance with the possibility for noise pickup and/or contacting hazardous voltages. Each SCM5B392 module set is made up of two modules: a voltage input/current output module and a current input/voltage output module (Figure 1).

The voltage input module connects to the servo or motor controller voltage output and provides an isolated 4 to 20mA output which connects to the input of the current input module. The current input module isolates and provides an output voltage identical to that of the servo or motor controller. Thus the original control signal has been isolated (twice) and extended via a 4 to 20mA current loop.

Several mounting options are available for the SCM5B392 module set. If a large number of channels are required, the SCMPB01 16 channel backpanel and SCMPB05 8 channel backpanel are available. Smaller channel numbers can be accommodated with the SCMPB03 single channel mounting panel and SCMPB04 dual channel mounting panel. These can be mounted on a DIN rail.

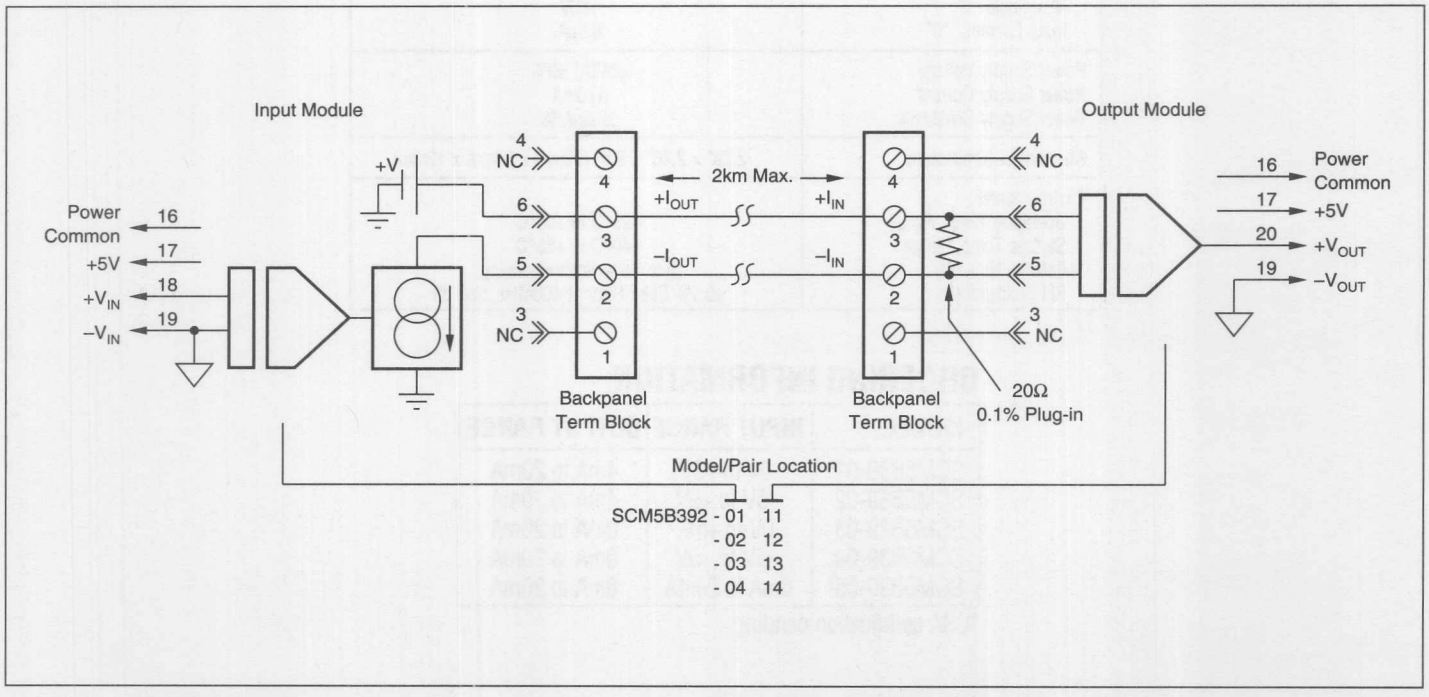


FIGURE 1. SCM5B392 Block Diagram.

SPECIFICATIONS Typical at TA= +25C and +5V Power

Module	SCM5B392-01,02,03,04 (INPUT)	SCM5B392-11,12,13,14 (OUTPUT)
Input Range	Up to ±10V	4 to 20mA
Input Maximum	±36V (no damage)	Protected to 240Vrms
Input Resistance	50MΩ	20Ω
Output Range	4 to 20mA	Up to ±10V
Loop Resistance Range	0 to 600Ω	NA
Output Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV		
Continuous	1500Vrms max, output to input	1500Vrms max, input to output
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50 or 60Hz)	100dB	*
Accuracy[1]	±0.05% Span	*
Nonlinearity	±0.02% Span	*
Stability		
Zero	±0.5µA/°C	±35µV/°C
Span	±20ppm/°C	±25ppm/°C
Noise		
Input (0.1Hz to 10Hz)	NA	10nArms
Output, 1kHz BW	10µAp-p	200µVrms
Bandwidth, -3dB	1kHz	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	170mA	30mA
Power Supply Sensitivity	±0.25µA/%	±20µV/% RTI [2]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temp. Range	-25°C to +85°C	*
Storage Temp. Range	-40°C to +85°C	*
Relative Humidity	0 to 95% noncondensing	*
RFI Susceptibility	±0.5% Span error at 400MHz, 5W, 3ft	*

*Same as input.
NOTES: (1) includes nonlinearity, hysteresis and repeatability. (2) RTI = Referenced to Input.

ORDERING INFORMATION

MODEL	INPUT RANGE	INTERFACE	OUTPUT RANGE
SCM5B392-0111	0V to +5V	4 to 20mA	0V to +5V
SCM5B392-0212	–5V to +5V	4 to 20mA	–5V to +5V
SCM5B392-0313	0V to +10V	4 to 20mA	0V to +10V
SCM5B392-0414	–10V to +10V	4 to 20mA	–10V to +10V

SCM5B40/41

Analog Voltage Input Modules, Wide Bandwidth

FEATURES

- ACCEPTS MILLIVOLT AND VOLTAGE LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 100dB CMR
- 10kHz SIGNAL BANDWIDTH
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- ±1µV/°C DRIFT
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B40 and SCM5B41 wide bandwidth voltage input module provides a single channel of analog input which is amplified, isolated, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B40 and SCM5B41 modules provides protection against accidental connection of power-line voltages up to 240VAC.

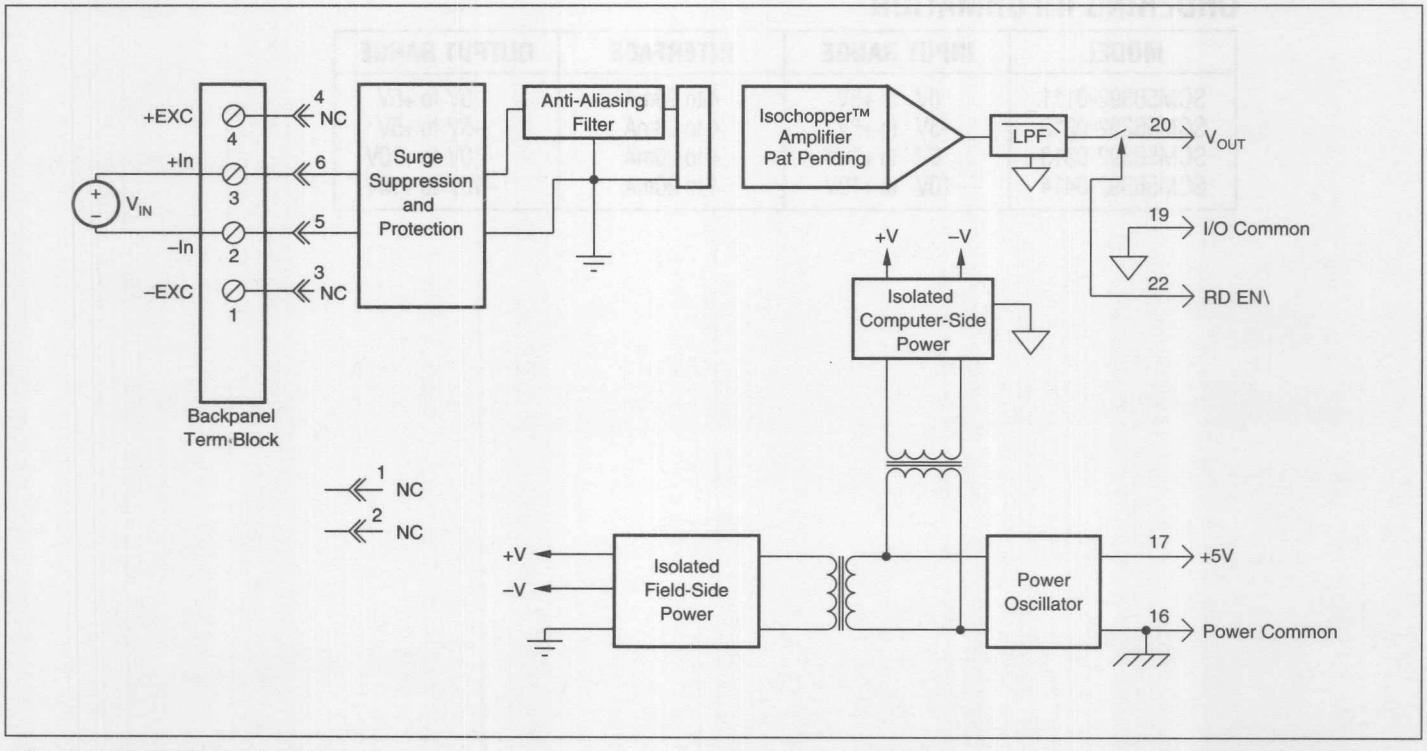


FIGURE 1. SCM5B40/41 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V Power.

Module	SCM5B40	SCM5B41
Input Range	±10mV to ±100mV	±1V to ±20V
Input Bias Current	±0.5nA	±0.05nA
Input Resistance		
Normal	200MΩ	650kΩ (minimum)
Power Off	40kΩ	650kΩ (minimum)
Overload	40kΩ	650kΩ (minimum)
Input Protection		
Continuous	240Vrms Max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50Hz or 60Hz)	100dB	*
NMR (–3dB at 10kHz)	120dB per Decade above 10kHz	*
Accuracy[1]	±0.05% Span ±10µV RTI[2] ±0.05%(V_Z[3])	±0.05% span ±0.2mV RTI[2] ±0.05% (V_Z[3])
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1µV/°C	±20µV/°C
Output Offset	±40µV/°C	*
Gain	±25ppm/°C	±50ppm/°C
Noise		
Input, 0.1 to 10Hz	0.4µVrms	2µVrms
Output, 100kHz	10mVp-p	*
Bandwidth, –3dB	10kHz	*
Rise Time, 10 to 90% Span	40µs	*
Setting Time, to 0.1%	250µs	*
Output Range†	±5V or 0V to +5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF	*
Output Current Limit	±20mA max	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0", "1"	0.5µA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	30mA	*
Power Supply Sensitivity	±2µV/% RTI[2]	±200µV/% RTI[2]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temp. Range	–25°C to +85°C	*
Storage Temp. Range	–40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft	*

* Same specification as SCM5B40.
NOTES: (1) Includes nonlinearity, hysteresis and repeatability.
(2) RTI = Referenced to input.
(3) V_Z is the input voltage that results in 0V output.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†
SCM5B40-01	–10mV to +10mV	–5V to +5V
SCM5B40-02	–50mV to +50mV	–5V to +5V
SCM5B40-03	–100mV to +100mV	–5V to +5V
SCM5B40-04	–10mV to +10mV	0V to +5V
SCM5B40-05	–50mV to +50mV	0V to +5V
SCM5B40-06	–100mV to +100mV	0V to +5V
SCM5B41-01	–1V to +1V	–5V to +5V
SCM5B41-02	–5V to +5V	–5V to +5V
SCM5B41-03	–10V to +10V	–5V to +5V
SCM5B41-04	–1V to +1V	0V to +5V
SCM5B41-05	–5V to +5V	0V to +5V
SCM5B41-06	–10V to +10V	0V to +5V
SCM5B41-07††	–20V to +20V	–5V to +5V
SCM5B41-08††	–20V to +20V	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††CSA certification pending.

SCM5B42
2-Wire Transmitter Interface Modules

FEATURES

- ISOLATED +20VDC CURRENT LOOP SUPPLY
- PROVIDES ISOLATION FOR NON-ISOLATED 2-WIRE TRANSMITTERS
- HIGH LEVEL VOLTAGE OUTPUT: +1V to +5V or +2V to +10V
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 100dB CMR
- 100Hz SIGNAL BANDWIDTH
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B42 2-wire transmitter interface module provides a single channel which accepts a 4 to 20 mA process current input and provides a standard +1 to +5V or +2 to +10V output signal (Figure 1). An isolated +20VDC regulated power supply is provided to power the current transmitter. This allows a 2-wire loop powered transmitter to be directly connected to the SCM5B42 without requiring an external power supply. The regulated supply will provide a nominal +20VDC at a loop current of 4mA to 20mA.

The SCM5B42 will provide a 1500V isolation barrier for non-isolated 2-wire field transmitters. It can also be used when additional isolation is required between an isolated 2-wire transmitter and the input stage of the control room computer.

The voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision 20Ω current conversion resistor is supplied with the module. Sockets are provided on the SCMPB01/02/03/04/05/06 backpanels to allow installation of this resistor. Extra resistors are available under part number SCMXR1. All field inputs are fully protected from accidental connection of power-line voltages up to 240VAC. The module has a 3dB bandwidth of 100Hz. Signal filtering is accomplished with a six-pole filter, with two poles on the field side of the isolation barrier, and the other four on the computer side.

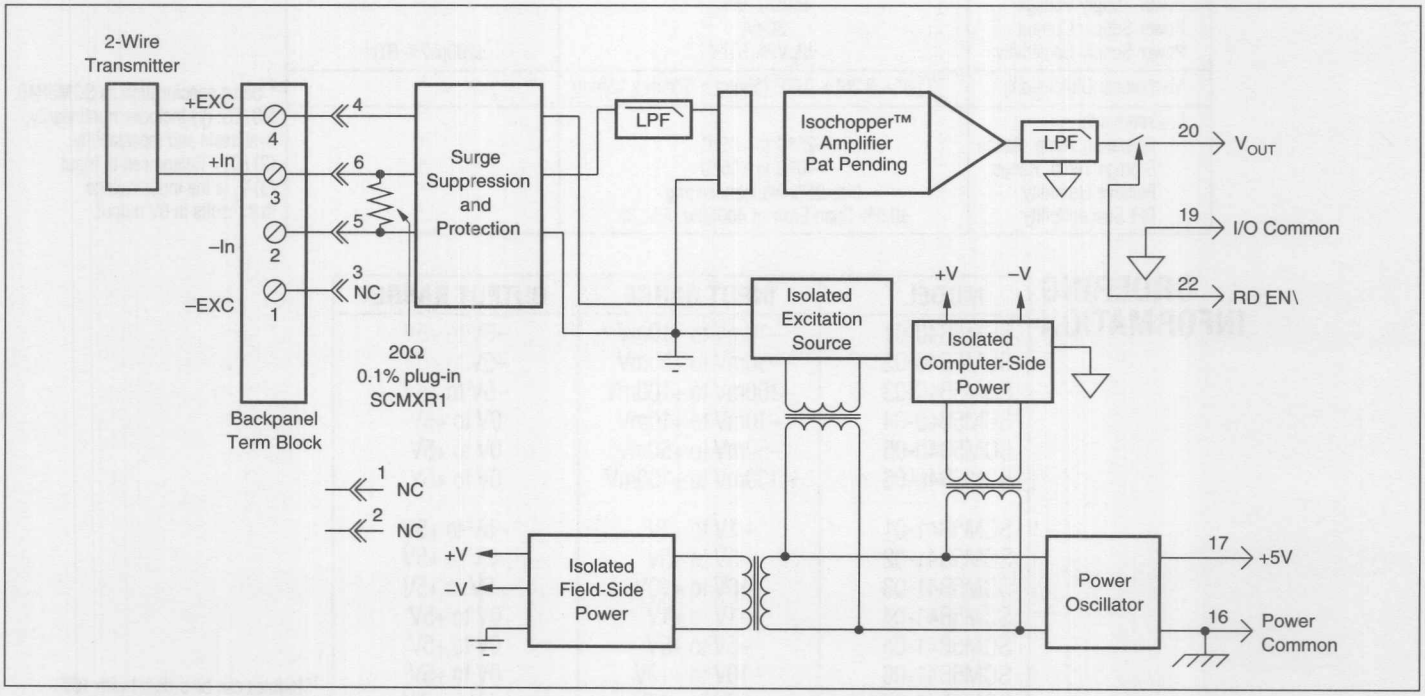


FIGURE 1. SCM5B42 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B42
Input Range	4mA to 20mA
Input Resistor	
Value	20.00Ω
Accuracy	±0.1%
Stability	±10ppm/°C
Loop Supply Voltage	Nominal 20V at 4mA to 20mA
Isolated Excitation Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	100dB
NMR (–3dB at 100Hz)	120dB per decade above 100Hz
Accuracy[1]	±0.05% span ±4µA RTI[2]
Nonlinearity	±0.02% span
Stability	
Input Offset	±1µV/°C
Output Offset	±40µV/°C
Gain	±25ppm/°C of reading
Noise	
Input, 0.1 to 10Hz	10nArms
Output, 100KHz	500µVrms
Bandwidth, –3dB	100Hz
Response Time, 90% span	4mS
Output Range	+1V to +5V or +2V to +10V
Output Resistance	50Ω
Output Protection	Continuous short to gnd
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Current Limit	±20mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0, 1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	180mA at transmitter load of 20mA 100mA at transmitter load of 4mA
Power Supply Sensitivity	±10µV/% RTI[2]
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	–25°C to +85°C
Storage Temp. Range	–40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% span error at 400MHz, 5W, 3 ft.

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.
(2) RTI = Referenced to input.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B42-01	4mA to 20mA	+1V to +5V
SCM5B42-02	4mA to 20mA	+2V to +10V

SCM5B45

Frequency Input Modules

FEATURES

- ACCEPTS FREQUENCY INPUTS OF 0 to 250kHz
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS
- TTL LEVEL INPUTS
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- ±0.1% ACCURACY
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B45 frequency input module provides a single channel of frequency input which is isolated and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers (Figure 1.)

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A special circuit in the input stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.

PRELIMINARY

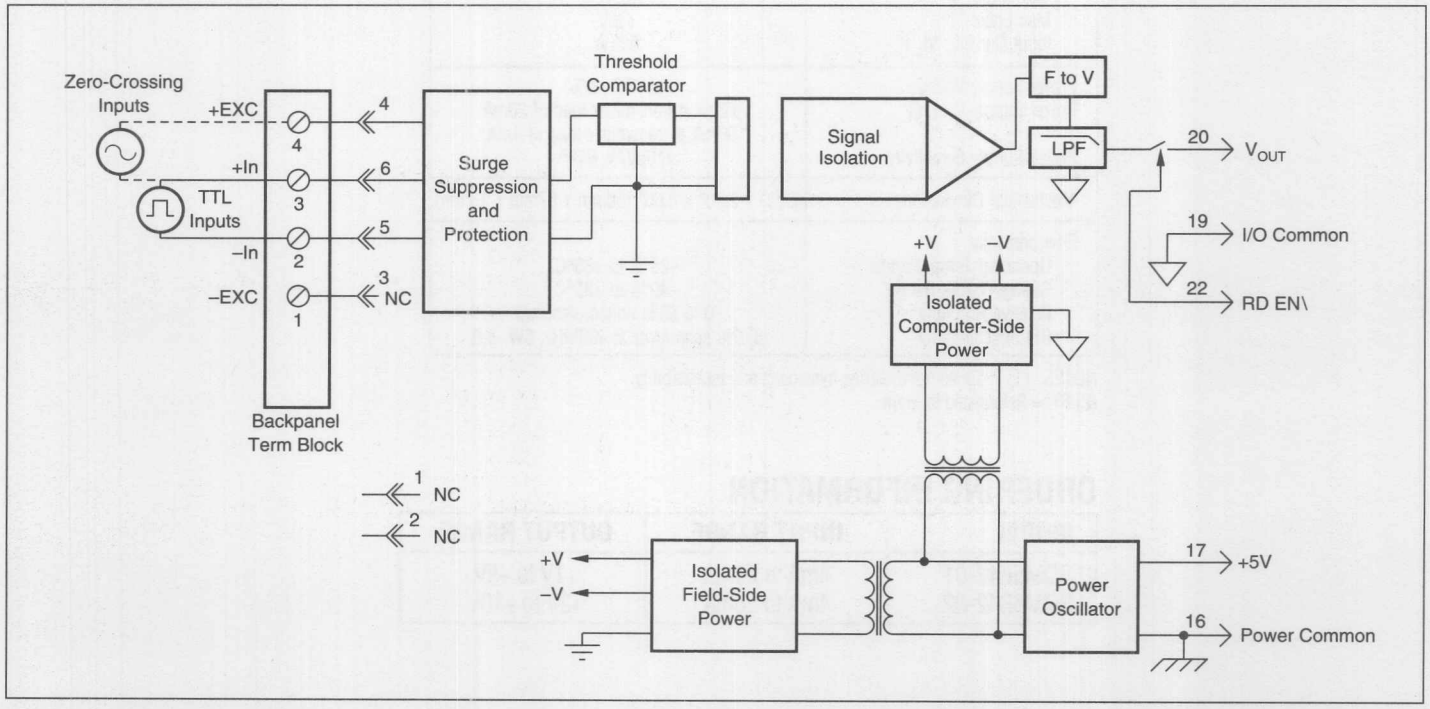


FIGURE 1. SCM5B45 Block Diagram.

SPECIFICATIONS Typical at Ta = +25C and +5V Power

Module	SCM5B45
Input Range	0 to 250kHz
Input Threshold	Zero Crossing
Pulse Width	2µs
TTL Input Low	0.8V max
TTL Input High	2.4V min
Input Hysteresis	0.02V, 1.5V
Input Resistance	
Normal	50MΩ
Power Off	40KΩ
Overload	40KΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Accuracy(1)	±0.1% Span
Noise	
Output Ripple	10mVp-p
Output Range†	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous short to ground
Output Selection Time (to ±1mV of V_{OUT})	6µs at C_{load} = 0 to 2000pF
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	100mA
Power Supply Sensitivity	50µV/% RTO (2)
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-25°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% Span error at 400MHz, 5W, 3ft

PRELIMINARY

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.
(2) RTO = Referenced to Output.

ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE†
SCM5B45-01	0 to 500Hz	0V to +5V
SCM5B45-02	0 to 1kHz	0V to +5V
SCM5B45-03	0 to 3kHz	0V to +5V
SCM5B45-04	0 to 5kHz	0V to +5V
SCM5B45-05	0 to 10kHz	0V to +5V
SCM5B45-06	0 to 25kHz	0V to +5V
SCM5B45-07	0 to 50kHz	0V to +5V
SCM5B45-08	0 to 100kHz	0V to +5V
SCM5B45-09	0 to 250kHz	0V to +5V

†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.

SCM5B47

Linearized Thermocouple Input Modules

FEATURES

- INTERFACES TO TYPES J, K, T, E, R, S, N, AND B THERMOCOUPLES
- LINEARIZES THERMOCOUPLE SIGNAL
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- ±1μV/°C DRIFT
- CSA CERTIFIED
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

DESCRIPTION

Each SCM5B47 thermocouple input module provides a single channel of thermocouple input which is filtered, isolated, amplified, linearized and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B47 can interface to eight industry standard thermocouple types: J, K, T, E, R, S, N, and B. Its corresponding output signal operates over a 0V to +5V range. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting backpanel. Upscale open thermocouple detect is provided by an internal pull-up resistor. Downscale indication can be implemented by installing an external 47MΩ resistor, ±20% tolerance, between screw terminals 1 and 3 on the SCMPB01/02/03/04/05/06 backpanels.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B47 modules provides protection against accidental connection of power-line voltages up to 240VAC.

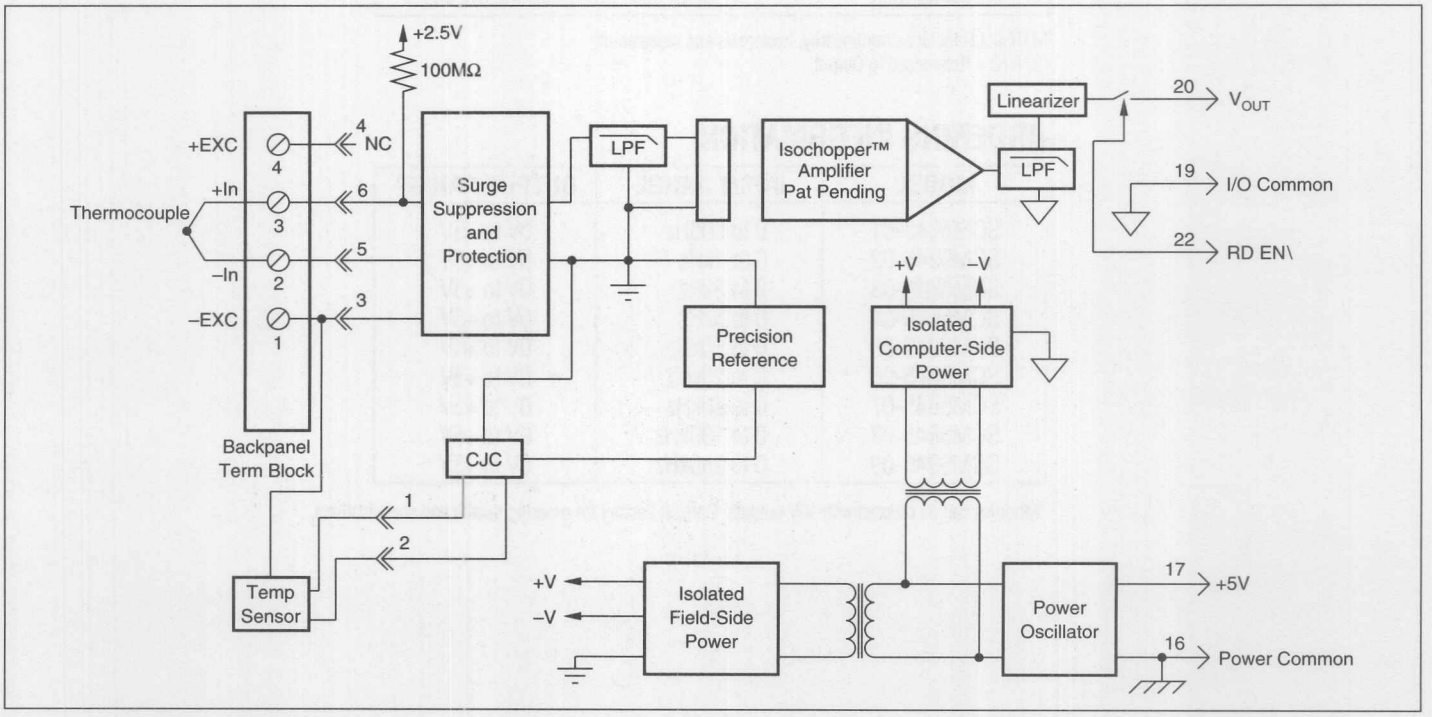


FIGURE 1. SCM5B47 Block Diagram.

SPECIFICATIONS Typical at T_A = +25°C and +5V power.

Module	SCM5B47
Input Range	–0.1V to +0.5V
Input Bias Current	–25nA
Input Resistance	
Normal	50MΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Stability	
Input Offset	±1µV/°C(1)
Output Offset	±20µV/°C
Gain	±25ppm/°C
Noise	
Input, 0.1 to 10Hz	0.2µVrms
Output, 100kHz	300µVp-p, 150µVrms
Bandwidth, –3dB	4Hz
Response Time, 90% Span	0.2s
Output Range†	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous Short to Ground
Output Selection Time	6µs at C_{load} = 0 to 2000pF
(to ±1mV of V_{OUT})	
Output Current Limit	±14mA max
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0", "1"	0.5µA
Open Input Response	Upscale
Open Input Detection Time	10s
Cold Junction Compensation	
Accuracy, 25°C	±0.25°C
Accuracy, +5°C to +45°C	±0.5°C
Accuracy, –25°C to +85°C	±1.0°C
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	±2µV/% RTI(2)
Mechanical Dimensions	2.28" x 2.26" x 0.6" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	–25°C to +85°C
Storage Temp. Range	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
RFI Susceptibility	±0.5% Span Error at 400MHz, 5W, 3ft

NOTES: (1) This is equivalent to °C as follows: Type J 0.020 °C/°C, Types K, T 0.025°C/°C, Type E 0.016°C/°C, Types R, S 0.168°C/°C, Type N 0.037°C/°C, Type C 0.072°C/°C. (2) Referenced to input.

ORDERING INFORMATION

*Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.
†Modules can be ordered with 10V outputs. Consult Factory for ordering details and specifications.
††CSA certification pending.

MODEL	TYPE	INPUT RANGE	OUTPUT RANGE†	ACCURACY*
SCM5B47J-01	Type J	0°C to +760°C (+32°F to +1400°F)	0V to +5V	±0.61°C
SCM5B47J-02	Type J	–100°C to +300°C (–148°F to +572°F)	0V to +5V	±0.32°C
SCM5B47J-03	Type J	0°C to +500°C (+32°F to 932°F)	0V to +5V	±0.36°C
SCM5B47K-04	Type K	0°C to +1000°C (+32°F to +1832°F)	0V to +5V	±0.80°C
SCM5B47K-05	Type K	0°C to +500°C (+32°F to +932°F)	0V to +5V	±0.38°C
SCM5B47T-06	Type T	–100°C to +400°C (–148°F to +752°F)	0V to +5V	±0.80°C
SCM5B47T-07	Type T	0°C to +200°C (+32°F to +392°F)	0V to +5V	±0.25°C
SCM5B47E-08	Type E	0°C to +1000°C (+32°F to +1832°F)	0V to +5V	±1.0°C
SCM5B47R-09	Type R	+500°C to +1750°C (+932°F to +3182°F)	0V to +5V	±1.3°C
SCM5B47S-10	Type S	+500°C to +1750°C (+932°F to +3182°F)	0V to +5V	±1.3°C
SCM5B47B-11	Type B	+500°C to +1800°C (+932°F to +3272°F)	0V to +5V	±2.0°C
SCM5B47J-12††	Type J	–100°C to +760°C (–148°F to +1400°F)	0V to +5V	±0.70°C
SCM5B47K-13††	Type K	–100°C to +1350°C (–148°F to +2462°F)	0V to +5V	±1.20°C
SCM5B47K-14††	Type K	0°C to +1200°C (+32°F to +2192°F)	0V to +5V	±0.96°C
SCM5B47N-15††	Type N	–100°C to +1300°C (–148°F to +2372°F)	0V to +5V	±1.15°C

SCM5B49
Voltage Output Modules

FEATURES

- ACCEPTS HIGH LEVEL VOLTAGE INPUTS TO ±10V
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS TO ±10V
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- OUTPUT PROTECTED TO 240VAC CONTINUOUS
- 110dB CMR
- 400Hz SIGNAL BANDWIDTH
- ±0.05% ACCURACY
- ±0.02% LINEARITY
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

PRELIMINARY

DESCRIPTION

Each SCM5B49 voltage output module provides a single channel of analog output. The track-and-hold circuit in the input stage can be operated in a hold mode where one DAC can supply many output modules, or a track mode where one DAC is dedicated to each module. In addition to the track-and-hold circuit, each module provides signal buffering, isolation, filtering, and conversion to a high level voltage output.

Setting of the track or hold mode is controlled by the logic state of WR EN\, module pin 23. When pin 23 is low, the track mode is enabled. If pin 23 is open or high, the hold mode is enabled. The module is designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the track and hold circuit. For a low state, simply connect pin 23, the Write-Enable pin to I/O Common, pin 19.

The SCMPB02 and SCMPB06 backpanels allow host computer control of the WR EN\ control line, which allows multiplexing of one host DAC to up to 64 SCM5B49 output modules. During power up, the output remains 0V output for 100ms, which allows the track-and-hold circuit to be initialized.

A special circuit in the output stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.

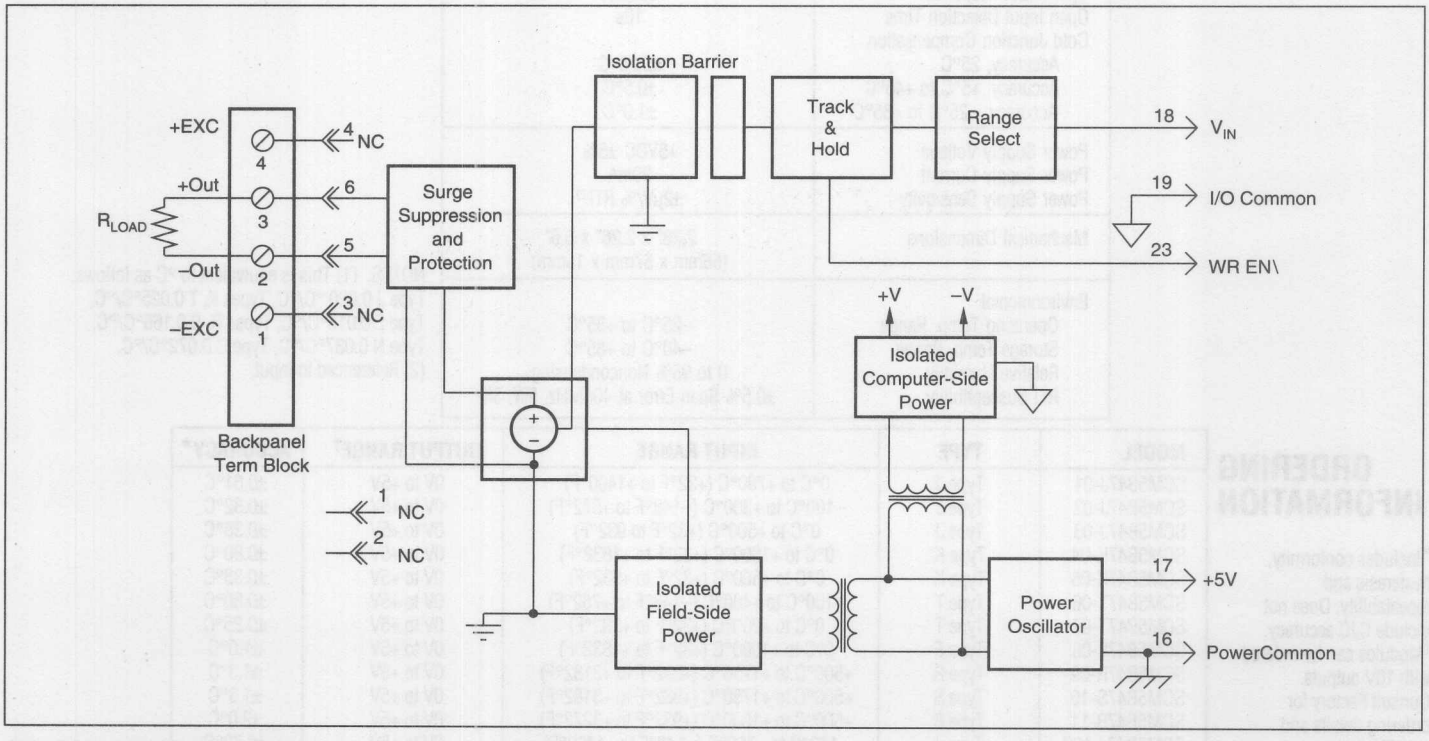


FIGURE 1. SCM5B49 Block Diagram.

SPECIFICATIONS Typical at TA= +25C and +5V Power

Module	SCM5B49
Input Voltage Range	±5V, 0 to +5V, ±10V, 0 to +10V
Input Voltage Maximum	±36V (no damage)
Input Resistance	50MΩ
Output Voltage Range	±5V, 0 to +5V, ±10V, 0 to +10V
Over Range Capability	10%
Output Drive	50mA max
Output I Under Fault, Max	60mA
Output Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Output to Input	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	110dB
Accuracy(1)	±0.05% span
Nonlinearity	±0.02% span
Stability	
Zero	±25ppm/°C
Span	±20ppm/°C
Noise	
Output Ripple, 1kHz bandwidth	5mVp-p
Bandwidth, -3dB	400Hz
Sample and Hold	
Output Droop Rate	0.2% Span/s
Acquisition Time	50µs
Track-and-Hold Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	170mA
Power Supply Sensitivity	±12.5ppm/%
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-25°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
RFI Susceptibility	±0.5% Span error at 400MHz, 5W, 3ft

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.

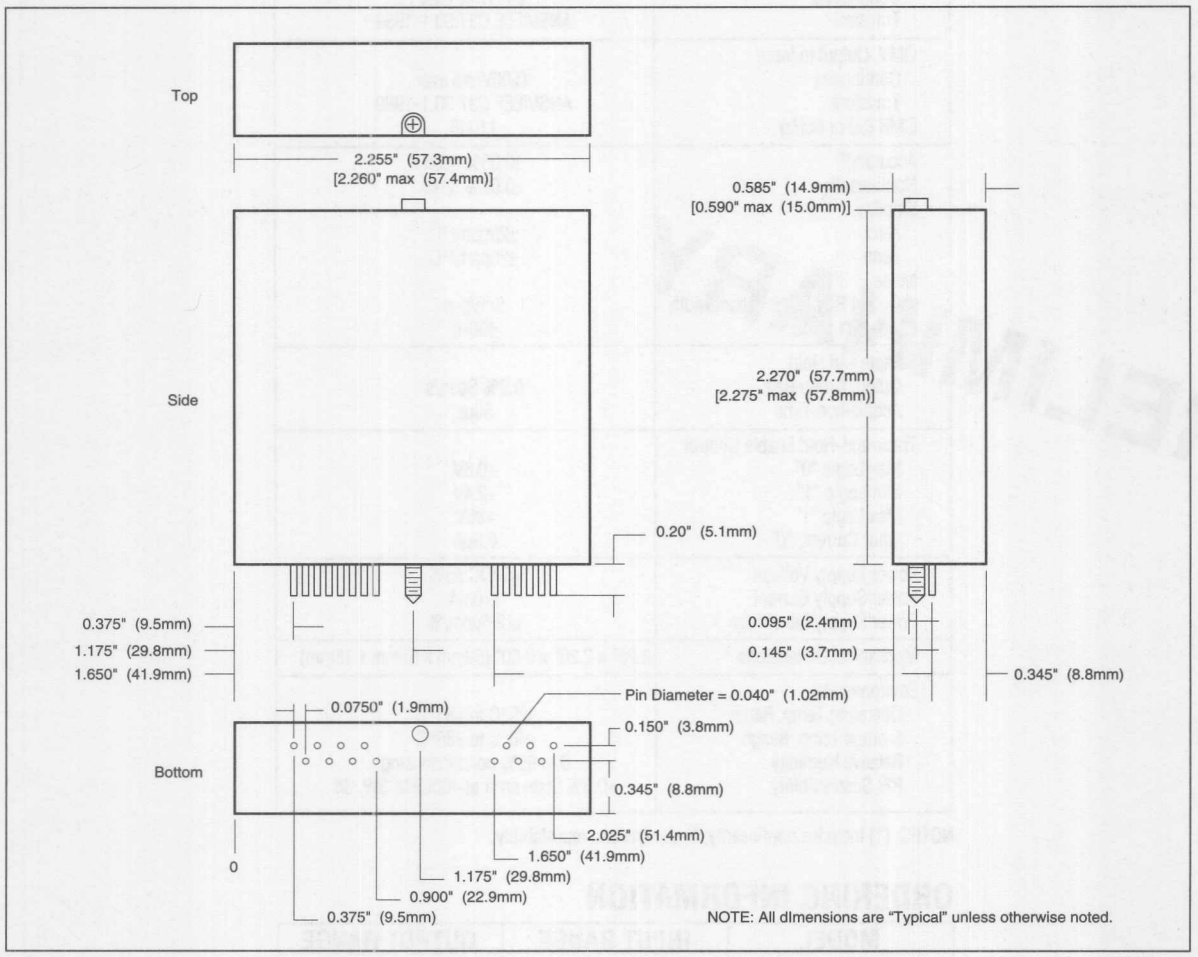
PRELIMINARY

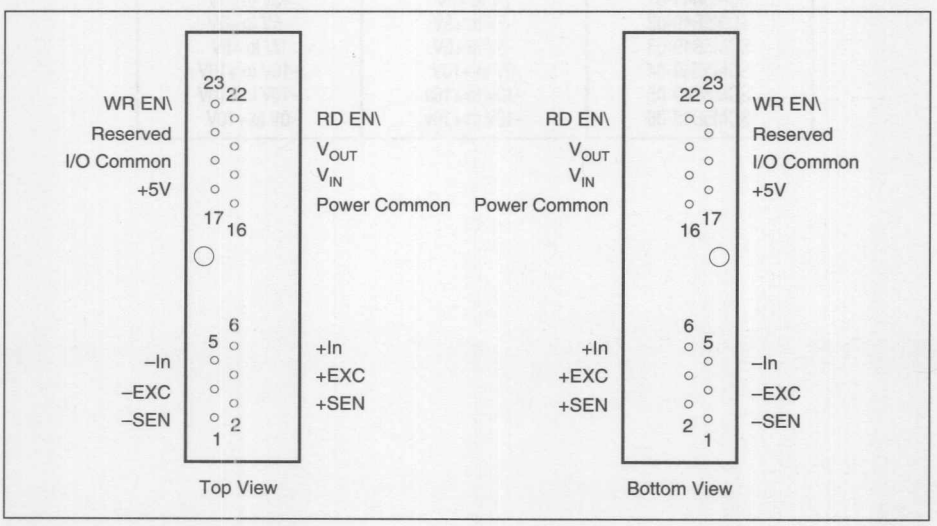
ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B49-01	0V to +5V	-5V to +5V
SCM5B49-02	-5V to +5V	-5V to +5V
SCM5B49-03	-5V to +5V	0V to +5V
SCM5B49-04	0V to +10V	-10V to +10V
SCM5B49-05	-10V to +10v	-10V to +10V
SCM5B49-06	-10V to +10v	0V to +10V

SCM5B
Module Dimensions and Pinouts

The following mechanical drawing is useful if designing circuit boards to mount the SCM5B modules. Many sockets are available which accept the mounting pins. As an example, AMP Inc. provides a socket with part number 1-331892-4. The captive nut for the 3mm mounting screw can be obtained from PEM (Penn Engineering and Manufacturing), part number KFS2-M3.





Accessories for SCM5B Analog Modules

FEATURES

- 1-, 2-, 8-, 16-POSITION BACKPANELS
- 19-INCH MOUNTING RACK FOR BACKPANELS
- MULTIPLEXED AND NON-MULTIPLEXED BACKPANELS
- INTERFACE CABLES
- MODULE EVALUATION BOARD
- CABLE-TO-SCREW-TERMINAL INTERFACE BOARD

SCMPB01 16 POSITION ANALOG I/O BACKPANEL, NON-MULTIPLEXED

DESCRIPTION

The SCMPB01 16 channel backpanel (Figure 1) can accept any of the SCM5B analog modules in any mixture. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB01 has 16 non-addressable analog I/O signal channels which provides each module with it's own analog bus. The module output switch is continuously "on" when using this backpanel and all sixteen module outputs are simultaneously accessible to high-speed data acquisition (ADC) boards. A set of inter-channel bridge jumpers permits connecting an input module's output to an output module's input, providing two levels of isolation. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 2 for schematic). Field connections are terminated with four screw terminals at each module site. Use system interface cable SCMXCA004-XX for connection to the host system.

SPECIFICATIONS

Operating Temperature:	–25°C to +85°C 95% relative humidity, non-condensing
Interface Connector:	
Field	High Density Screw Clamp, 14 AWG Max
Logic	26-pin, male header connector

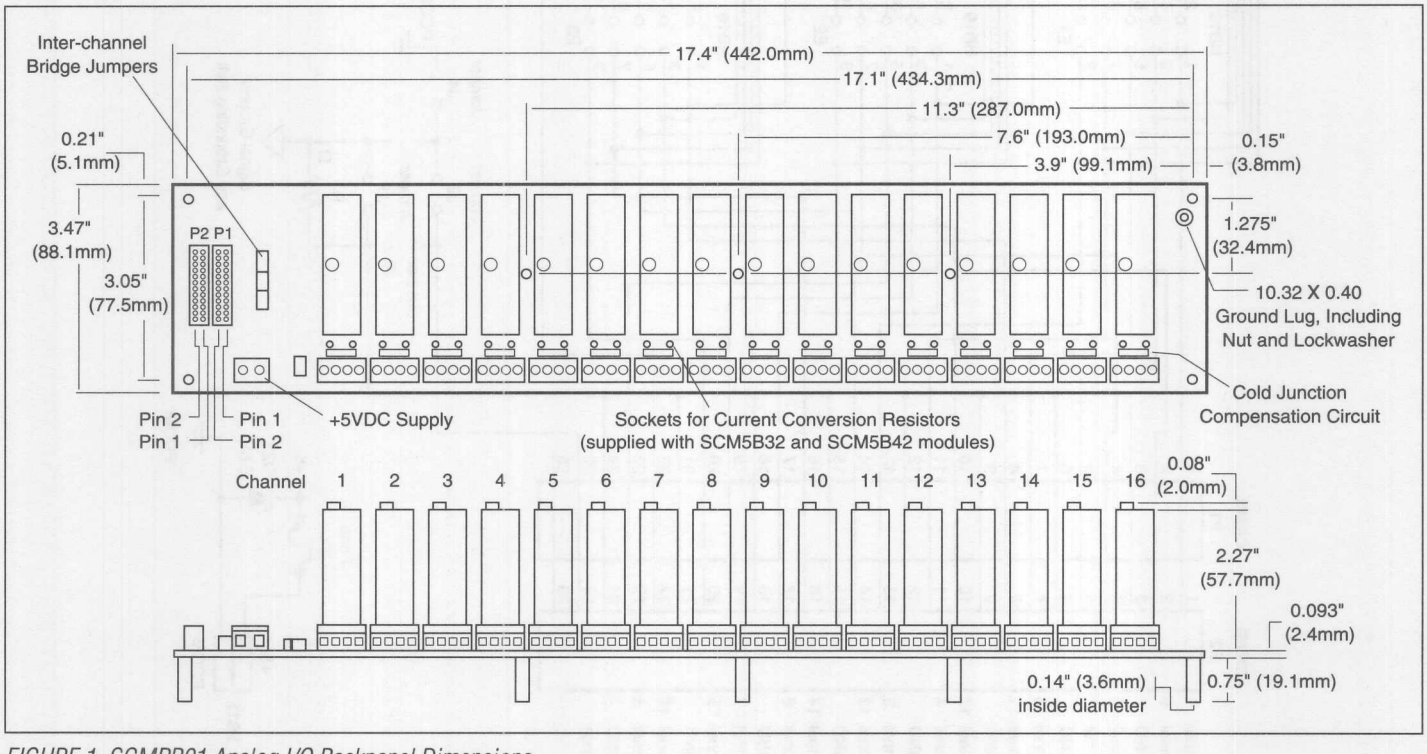
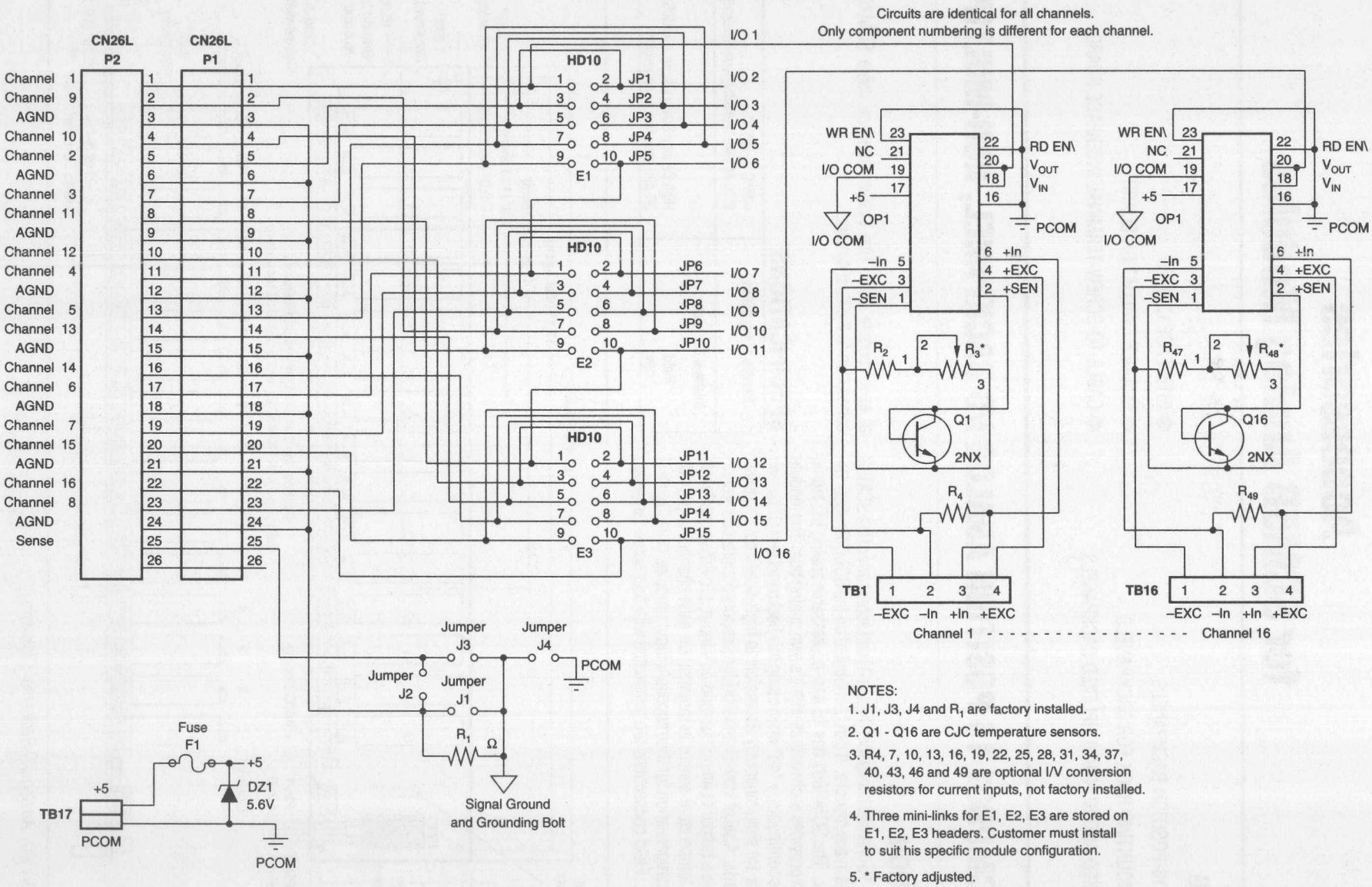


FIGURE 1. SCMPB01 Analog I/O Backpanel Dimensions.



NOTES:

1. J1, J3, J4 and R_1 are factory installed.
2. Q1 - Q16 are CJC temperature sensors.
3. R4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46 and 49 are optional I/V conversion resistors for current inputs, not factory installed.
4. Three mini-links for E1, E2, E3 are stored on E1, E2, E3 headers. Customer must install to suit his specific module configuration.
5. * Factory adjusted.

FIGURE 2. SCMPB01 Schematic.

ELECTRICAL

P1 AND P2 CONNECTOR

Connection to the host system is made at connectors P1 and P2. These connectors are electrically equivalent. Two connectors are provided to allow both analog input and analog output from host systems having individual input and output connectors.

ADJACENT CHANNEL JUMPERS

Adjacent channels may be connected together to provide an isolated output signal from an isolated input module, providing two levels of 1500V isolation. This capability is provided with the 15 jumpers labeled JP1 through JP15 on headers E1, E2, and E3. A simplified drawing of the SCMPB01 schematic for Channel 1 through 4 is shown in Figure 3.

Example: Assume an SCM5B30 input module is installed in Channel 1 position and an SCM5B39 output module is installed in Channel 2 position. If JP1 is installed, the output of Channel 1 is connected to the input of Channel 2, which provides two levels of 1500V isolation.

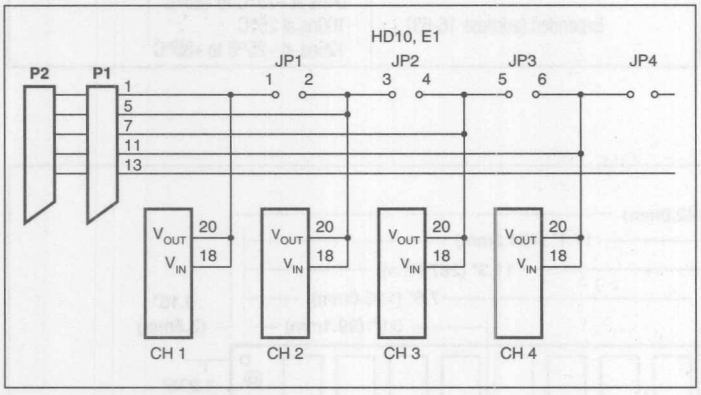


FIGURE 3. SCMPB01 Adjacent Channel Jumpers.

POWER

The SCMPB01 backpanel requires external +5VDC ±5% power. The chassis mounted SCMXPRE-003 or SCMXPRT-003 power supplies have adequate capacity to power any combination of modules.

FUSING

The SCMPB01 backpanel power is fuse protected through F1. This is a Littlefuse type 252004, 4 amp fuse. Zener diode DZ1 provides extra protection by clamping the input power voltage to +5.6V. If the input supply voltage connection is reversed, this zener diode will be forward biased and fuse F1 will be blown.

GROUNDING

Figure 4 details the optional ground jumper configuration available on the SCMPB01 backpanel. Jumpers J1, J3, and J4 are factory installed.

Jumper J1 connects the AGND shield wires (pins 3, 6, 9, 12, 15, 18, 21, and 24) to the backpanel signal ground. This provides a ground connection between the host system and backpanel. Jumper J1 is required if output modules (SCM5B39, SCM5B49) are used, or if there is no high impedance sense input (input low of a differential or pseudo-differential system) on the host measurement system.

Jumper J3 connects the SENSE line (pin 25) to the backpanel signal ground. If the host system has the capability, this allows measuring the SCMPB01 ground potential.

For proper operation of the output switch or track-and-hold circuit when using the SCMPB01/05 backpanels, a current path must exist between the host control logic power common and module I/O Common (module pin 19). This path can be established on the SCMPB01 via jumper J4. If this connection exists elsewhere in the system, jumper J4 should be removed since possible ground loops could exist. Other connections of power ground

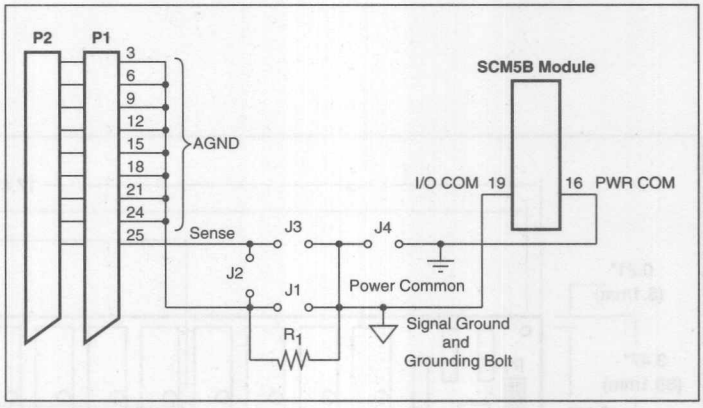


FIGURE 4. SCMPB01 Grounding Diagram.

and signal ground usually occur at the A/D or D/A converter of the host measurement system. More information on grounding can be found in Application Note AN502.

If the connection of power common and AGND shield wires exist in the host measurement system, an optional resistive connection between AGND and the backpanel signal ground can be made via R_1. R_1 can be as large as 10K ohms; 100 ohms is a recommended value. Jumper J2 can be used to connect the SENSE line to R_1 when this ground configuration is used.

For full protection against large electrical disturbances on the field-side of the SCM5B modules, a #10-32 ground stud is provided on the backpanel. An electrical connection between this ground stud and system ground should be provided with a large gauge wire of the shortest possible length. When this connection is made, a possible ground loop could result through the AGND shield wires and backpanel signal ground. If the application involves only input modules and a differential input is used by the host measurement system, J1 should be removed. Remember that J1 is required if output modules are used or if the host system does not have differential inputs.

SCMPB02 16 POSITION ANALOG I/O BACKPANEL, MULTIPLEXED

DESCRIPTION

The SCMPB02 16 channel backpanel (Figure 5) can accept any of the SCM5B analog modules in any mixture. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB02 has two analog buses; one for analog input and one for analog output. This two-bus configuration takes advantage of the switch controlled outputs on the input modules and the track-and-hold inputs on the output modules. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 6 for schematic). Field connections are terminated with four screw terminals at each module site. Up to four SCMPB02 backpanels may be daisy-chained. Use SCMXCA005 cable for daisy chaining and SCMXCA004-XX cable for connecting to host computer.

SPECIFICATIONS

Operating Temperature:	–25°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	 High Density Screw Clamp, 14 AWG Max 26-pin, male header connector
Address Input Logic Levels: Max Logic "0" Min Logic "1"	 0.8V 2.0V

I_I Input Current, "0" or "1"	0.1µA max at 25°C 1.0µA max –25°C to +85°C
RD EN\ or WR EN\ Signal Delay from Connector P1 to Channels 1-16 Standalone (address 0-15) Expanded (address 16-63)	 51ns at 25°C 64ns at –25°C to +85°C 100ns at 25°C 126ns at –25°C to +85°C

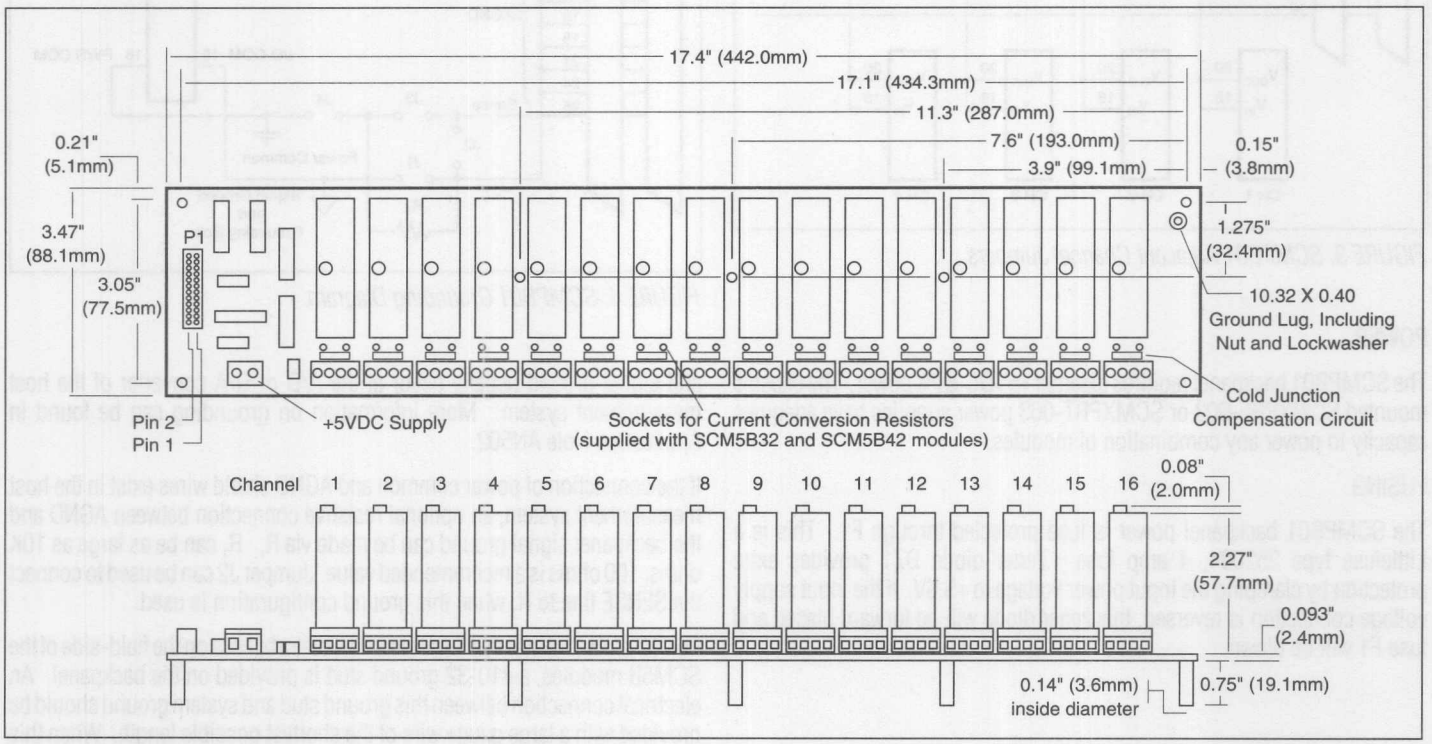
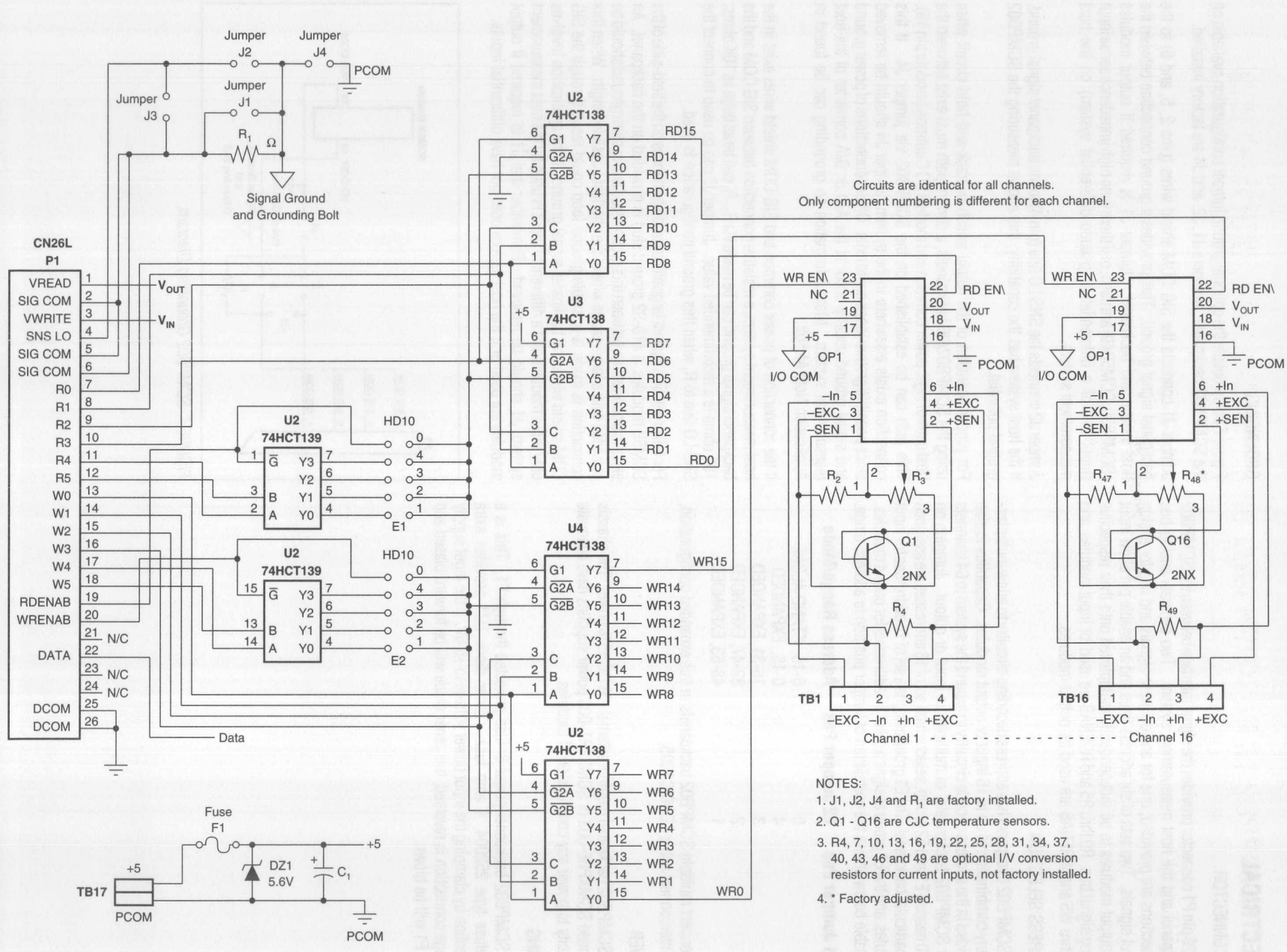


FIGURE 5. SCMPB02 Analog I/O Backpanel.



NOTES:

1. J1, J2, J4 and R_1 are factory installed.
2. Q1 - Q16 are CJC temperature sensors.
3. R4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46 and 49 are optional I/V conversion resistors for current inputs, not factory installed.
4. * Factory adjusted.

FIGURE 6. SCMPB02 Schematic.

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ELECTRICAL

P1 CONNECTOR

The 26 pin P1 connector provides the signal interface between the SCMPB02 backpanel and the host measurement system. Two separate analog bus connections are provided; one for analog input signals and one for analog output signals. Two sets of six address lines and an enable pin allow input and output modules to be independently multiplexed onto their respective analog signal bus. R0 thru R5 and RDENAB are used for input modules, and W0 thru W5 and WRENAB are used for output modules.

ADDRESS SELECTION

The SCMPB02 backpanel has address decoding circuitry to allow multiplexing any combination of up to 16 input or output modules. Capability is also provided in the address decode circuitry to expand the system to 64 channels (four SCMPB02 backpanels) of multiplexed input or output. Jumpers on HD10 header, E1 and E2 group, select which set of 16 addresses are assigned to a particular backpanel. The E1 group assigns a set of 16 addresses for input modules, and the E2 group assigns a set of 16 addresses for output modules. The table below shows the correlation of jumper position to address range.

E1 Jumper Pos	E2 Jumper Pos	Address Range/Mode
0	0	0-15, STAND ALONE
4	4	0-15, EXPANDED
3	3	16-31, EXPANDED
2	2	32-47, EXPANDED
1	1	48-63, EXPANDED

To connect multiple SCMPB02 backpanels in this expanded configuration, use interconnect cable SCMXCA005.

POWER

The SCMPB02 backpanel requires external +5VDC ±5% power. The chassis mounted SCMXPRE-003 or SCMXPRT-003 power supplies have adequate capacity to power any combination of modules.

FUSING

The SCMPB02 backpanel power is fuse protected through F1. This is a Littlefuse type 252004, 4 amp fuse. Zener diode DZ1 provides extra protection by clamping the input power voltage to +5.6V. If the input supply voltage connection is reversed, this zener diode will be forward biased and fuse F1 will be blown.

GROUNDING

Figure 7 below details the optional ground jumper configuration available on the SCMPB02 backpanel. Jumpers J1, J2, and J4 are factory installed.

Jumper J1 connects the SIG COM shield wires (pins 2, 5, and 6) to the backpanel signal ground. This provides a ground connection between the host system and backpanel. Jumper J1 is required if output modules (SCM5B39, SCM5B49) are used, or if there is no high impedance sense input (input low of a differential or pseudo-differential system) on the host measurement system.

Jumper J2 connects the SNS LO line (pin 4) to the backpanel signal ground. If the host system has the capability, this allows measuring the SCMPB02 ground potential.

For proper operation of the output switch or track-and-hold circuit when using the SCMPB02/06 backpanels, a current path must exist between the host control logic power common and module I/O Common (module pin 19). This path can be established on the SCMPB02 via jumper J4. If this connection exists elsewhere in the system, jumper J4 should be removed since possible ground loops could exist. Other connections of power ground and signal ground usually occur at the A/D or D/A converter of the host measurement system. More information on grounding can be found in Application Note AN502.

If the connection of power common and SIG COM shield wires exist in the host measurement system, a resistive connection between SIG COM and the backpanel signal ground can be made via R_1. R_1 can be as large as 10K ohms; 100 ohms is a recommended value. Jumper J3 can be used to connect the SNS LO line to R_1 when this ground configuration is used.

For full protection against large electrical disturbances on the field-side of the SCM5B modules, a #10-32 ground stud is provided on the backpanel. An electrical connection between this ground stud and system ground should be provided with a large gauge wire of the shortest possible length. When this connection is made, a possible ground loop could result through the SIG COM shield wires and backpanel signal ground. If the application involves only input modules and a differential input is used by the host measurement system, J1 should be removed. Remember that J1 is required if output modules are used or if the host system does not have differential inputs.

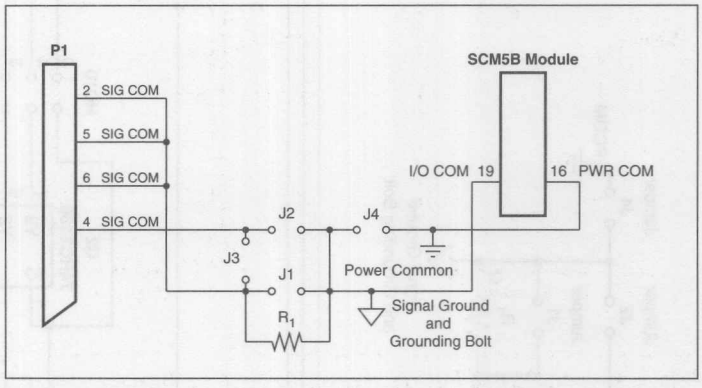

FIGURE 7. SCMPB02 Grounding Diagram.

SCMPB03/SCMPB04 ONE/TWO POSITION ANALOG I/O BACKPANELS

DESCRIPTION

The SCMPB03 is a single channel mounting panel for the SCM5B modules. The SCMPB04 is a dual channel mounting panel for the SCM5B modules (Figure 8). They both are DIN rail compatible.

See Figures 10 and 11 for wiring diagrams.

The following accessories are required for mounting one SCMPB03/04 panel:

Qty	Model	Description
1	SCMXBEFE	Base element with snap foot
2	SCMXSE	Side element

The following accessories are required for mounting two or more SCMPB03/04 panels:

Qty	Model	Description
2	SCMXBEFE	Base element with snap foot
2	SCMXSE	Side element
(# panels)-2	SCMXBE	Base element without snap foot
(4 x (# panels))-4	SCMXVS	Connection pins

The following DIN rail styles are available. Specify length in meters (-XX)

SCMX RAIL 1-XX	Gull wing style, perforated

SPECIFICATIONS

Operating Temperature:	–25°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	 High Density Screw Clamp, 14 AWG Max High Density Screw Clamp, 14 AWG Max

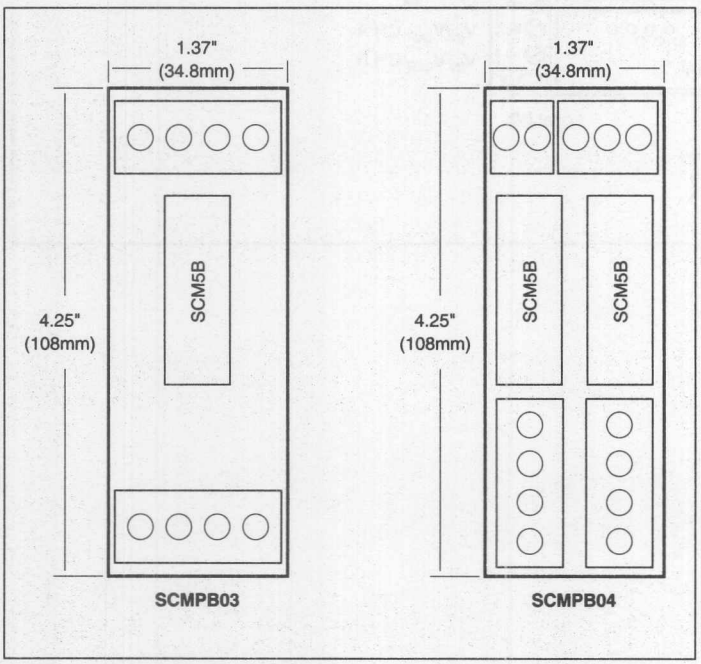

FIGURE 8. SCMPB03, SCMPB04 Analog I/O Mounting Panel Dimensions.

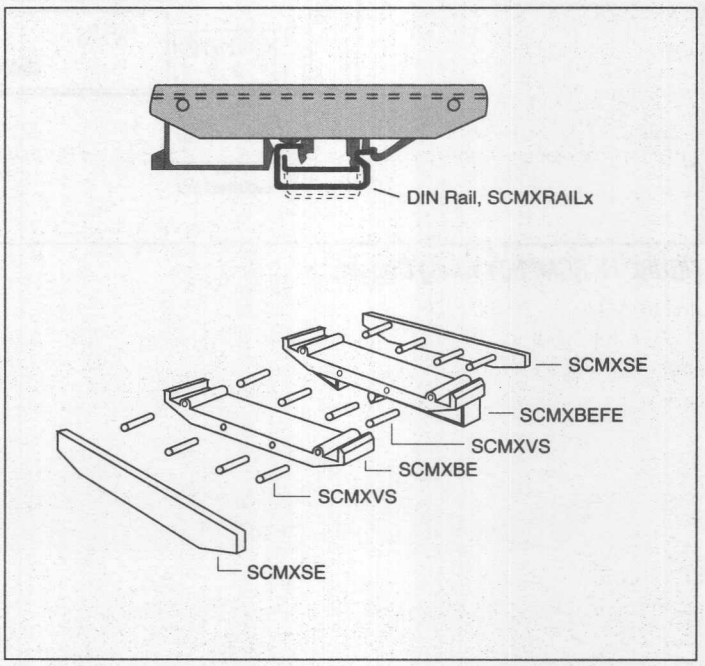

FIGURE 9. DIN Rail Mounting Elements.

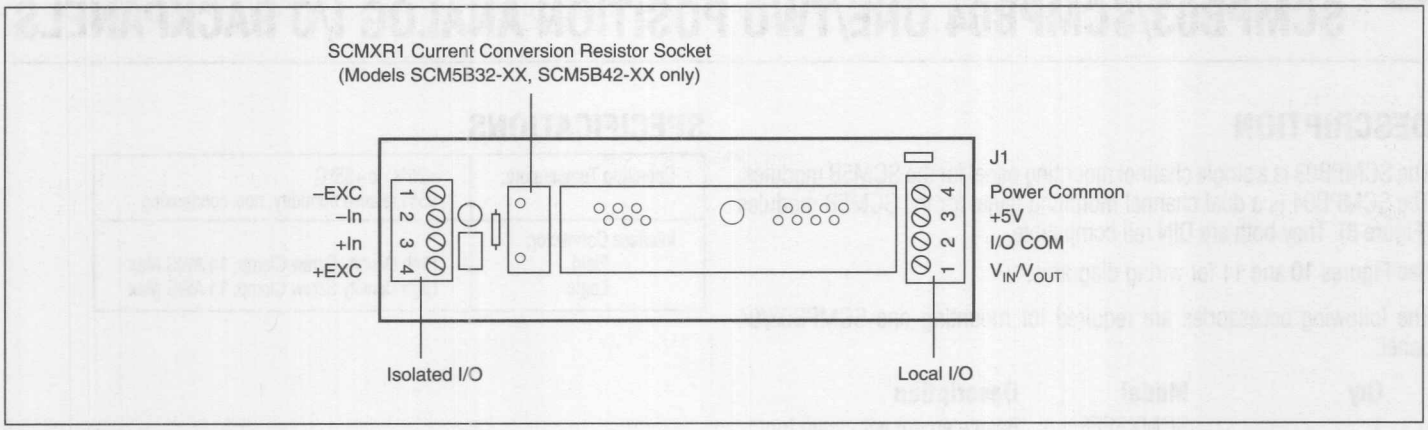

FIGURE 10. SCMPB03 Wiring Diagram.

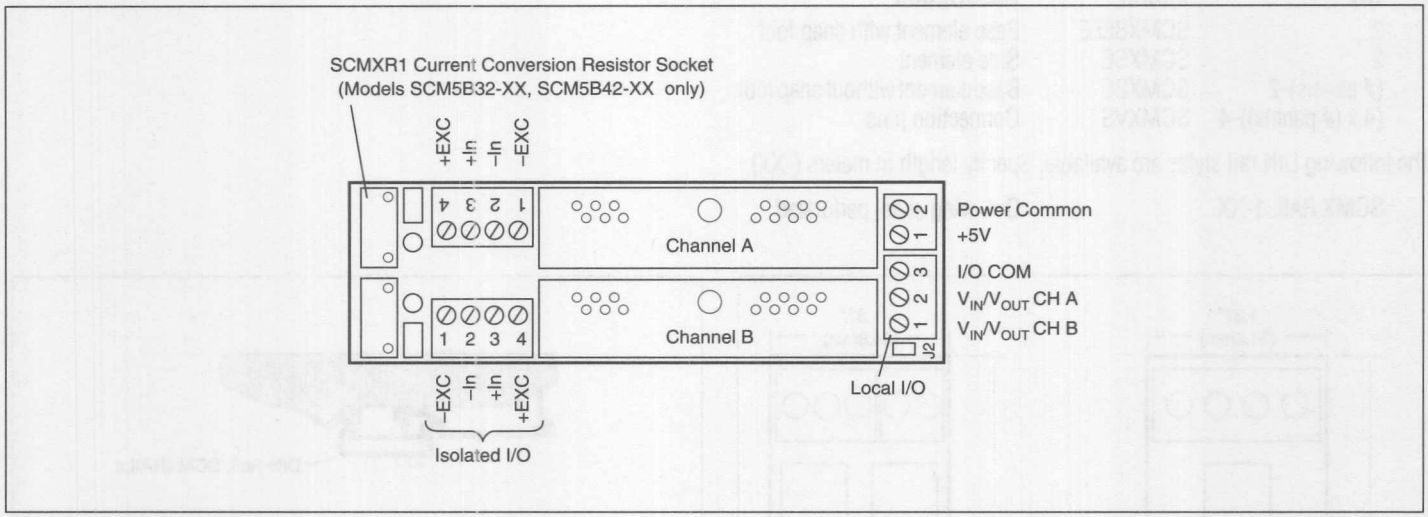

FIGURE 11. SCMPB04 Wiring Diagram.

SCMPB05 8 POSITION ANALOG I/O BACKPANEL, NON-MULTIPLEXED

DESCRIPTION

The SCMPB05 analog module mounting board has a capacity of eight analog input and/or output modules in any combination. It can be mounted on the SCMXRK-002 19-inch metal rack. A separate analog signal path is provided for each channel and each channel's signal is accessible at redundant 26-pin connectors. The module output switch is continuously "on" when using this backpanel and all eight module outputs are simultaneously accessible to high-speed data acquistion (ADC) boards.

On-board jumpers permit paralleling two SCMPB05 boards to form a SCMPB01 equivalent. An additional set of inter-channel bridge jumpers permits connecting an input module's output to an output module's input, providing two levels of isolation (Figures 12, 13).

Jumpers on the SCMPB05 permit user selection of low (i.e. channels 0-7) or high (i.e. channels 8-15) addresses.

A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 13 for Schematic). Field connections are terminated with four screw terminals at each module site. Use system interface cable SCMXCA004-XX for connection to the host system.

SPECIFICATIONS

Operating Temperature:	–25°C to +85°C 95% relative humidity, non-condensing
Interface Connector:	
Field	High Density Screw Clamp, 14 AWG Max
Logic	26-pin, male header connector

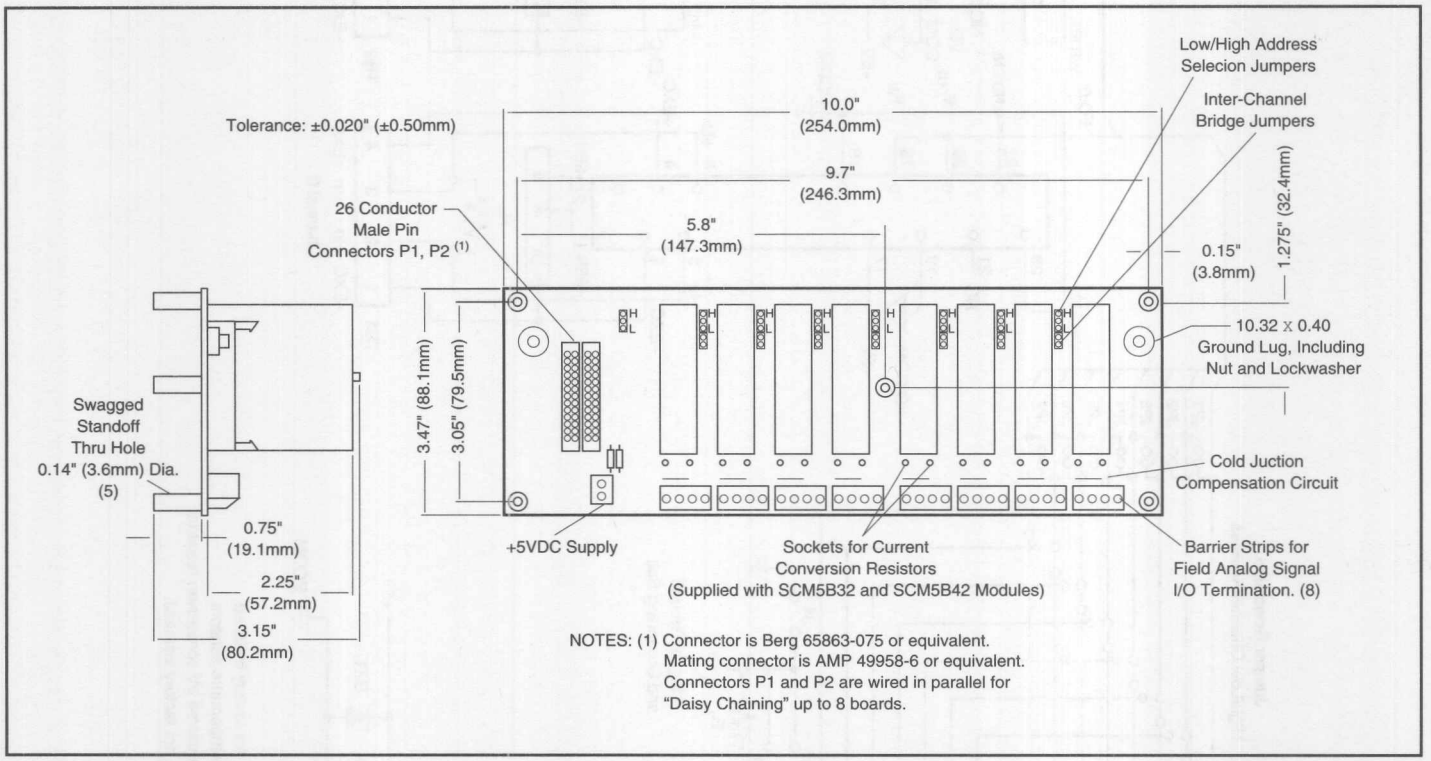

FIGURE 12. SCMPB05 Analog I/O Backpanel.

ELECTRICAL

ADDRESS SELECTION

Module addresses may be selected as low (channels 0-7) or high (channels 8-15) using the set of 3 pins next to each module position. Place a jumper over the two pins closest to the field I/O termination blocks to select a low address (factory configuration) or over the two pins furthest from the field I/O termination blocks to select a high address.

ADJACENT CHANNEL JUMPERS

Adjacent channels may be connected together to provide an isolated output signal from an isolated input module, providing two levels of 1500V isolation. This capability is provided with the seven jumpers located between module positions. See page 39 for an example.

Refer to page 39 for additional notes on the P1 and P2 connectors, power requirements, fusing and grounding issues.

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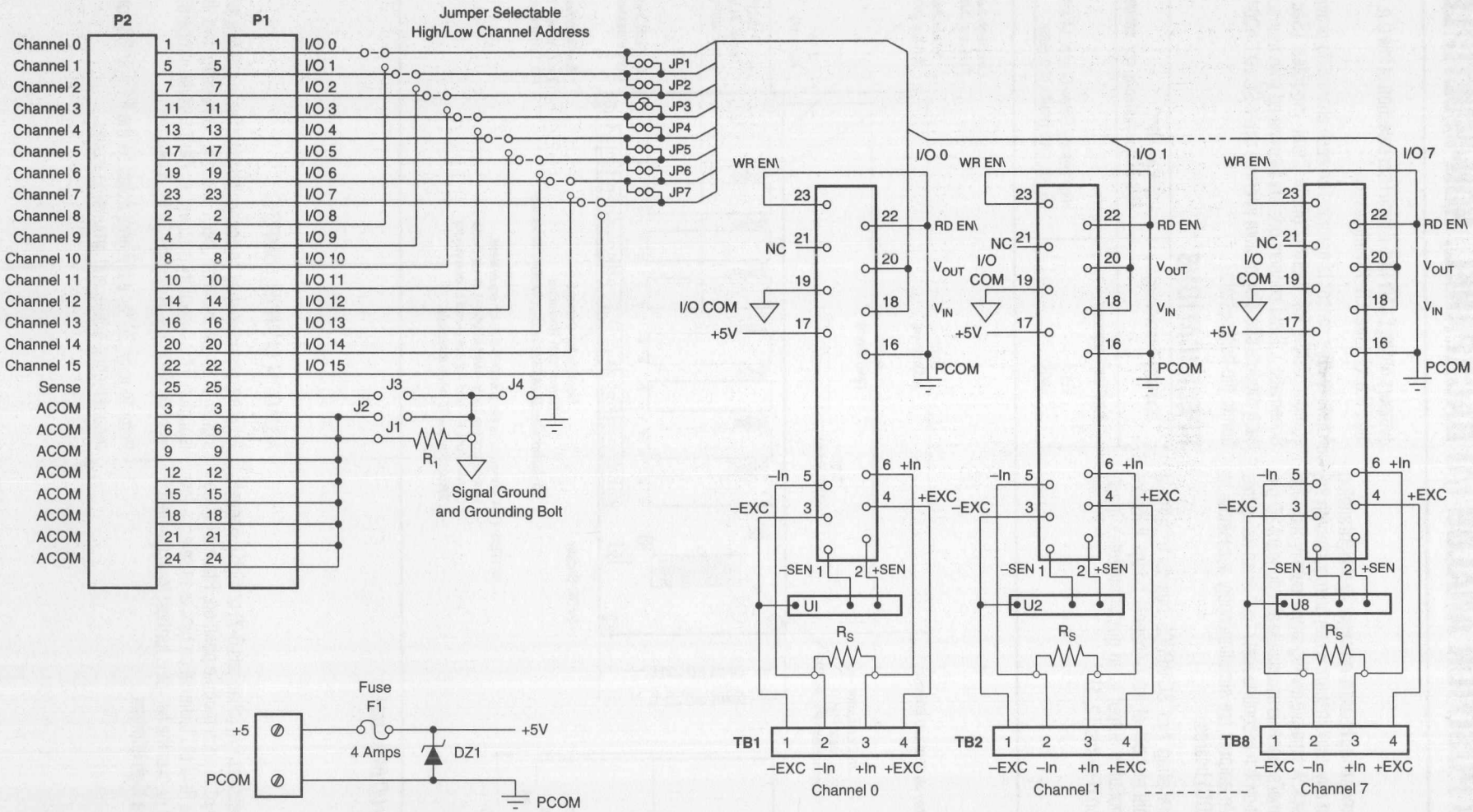


NOTES: 1. J1, J3, J4 and R_1 are factory installed.
2. U1- U8 are CJC temperature sensors.
3. Resistors R_S are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 13. SCMPB05 Schematic.

SCMPB06 8 POSITION ANALOG I/O BACKPANEL, MULTIPLEXED

DESCRIPTION

The SCMPB06 backpanel (Figure 14) can accept up to eight SCM5B modules in any combination. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB06 has two analog buses; one for analog input and one for analog output. This two-bus configuration takes advantage of the switch controlled outputs on the input modules and the track-and-hold inputs on the output modules. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 15 for schematic). Field connections are terminated with four screw terminals at each module site. Up to eight SCMPB06 backpanels may be daisy-chained. Use SCMXCA005 cable for daisy chaining and SCMXCA004-XX cable for connecting to host computer.

Jumpers on the SCMPB06 permit user selection of low (i.e. channels 0-7) or high (i.e. channels 8-15) addresses.

SPECIFICATIONS

Operating Temperature:	–25°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	 High Density Screw Clamp, 14 AWG Max 26-pin, male header connector
Address Input Logic Levels: Max Logic "0" Min Logic "1"	 0.8V 2.0V

I_i Input Current, "0" or "1"	0.1µA max at 25°C 1.0µA max –25°C to +85°C
RD EN\ or WR EN\ Signal Delay from Connector P1 to Channels 0-7 Standalone (address 0-7) Expanded (address 8-63)	 51ns at 25°C 64ns at –25°C to +85°C 100ns at 25°C 126ns at –25°C to +85°C

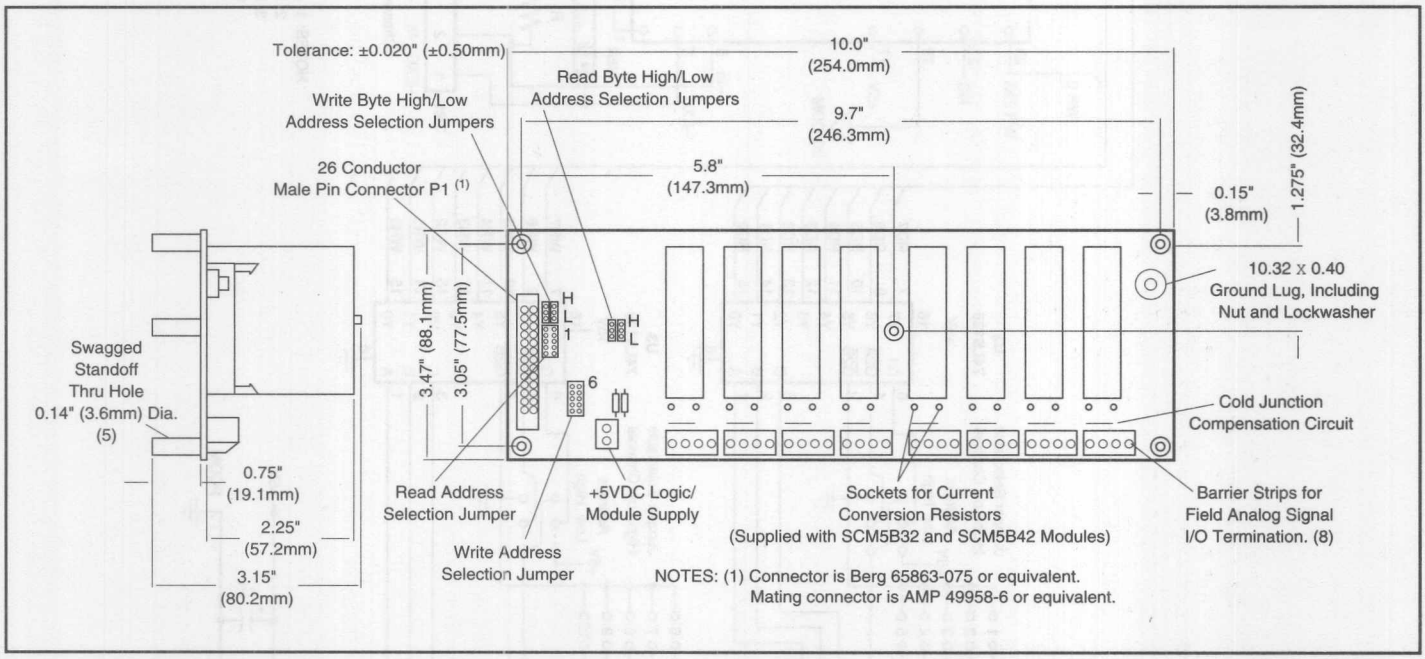


FIGURE 14. SCMPB06 Analog I/O Backpanel.

ELECTRICAL

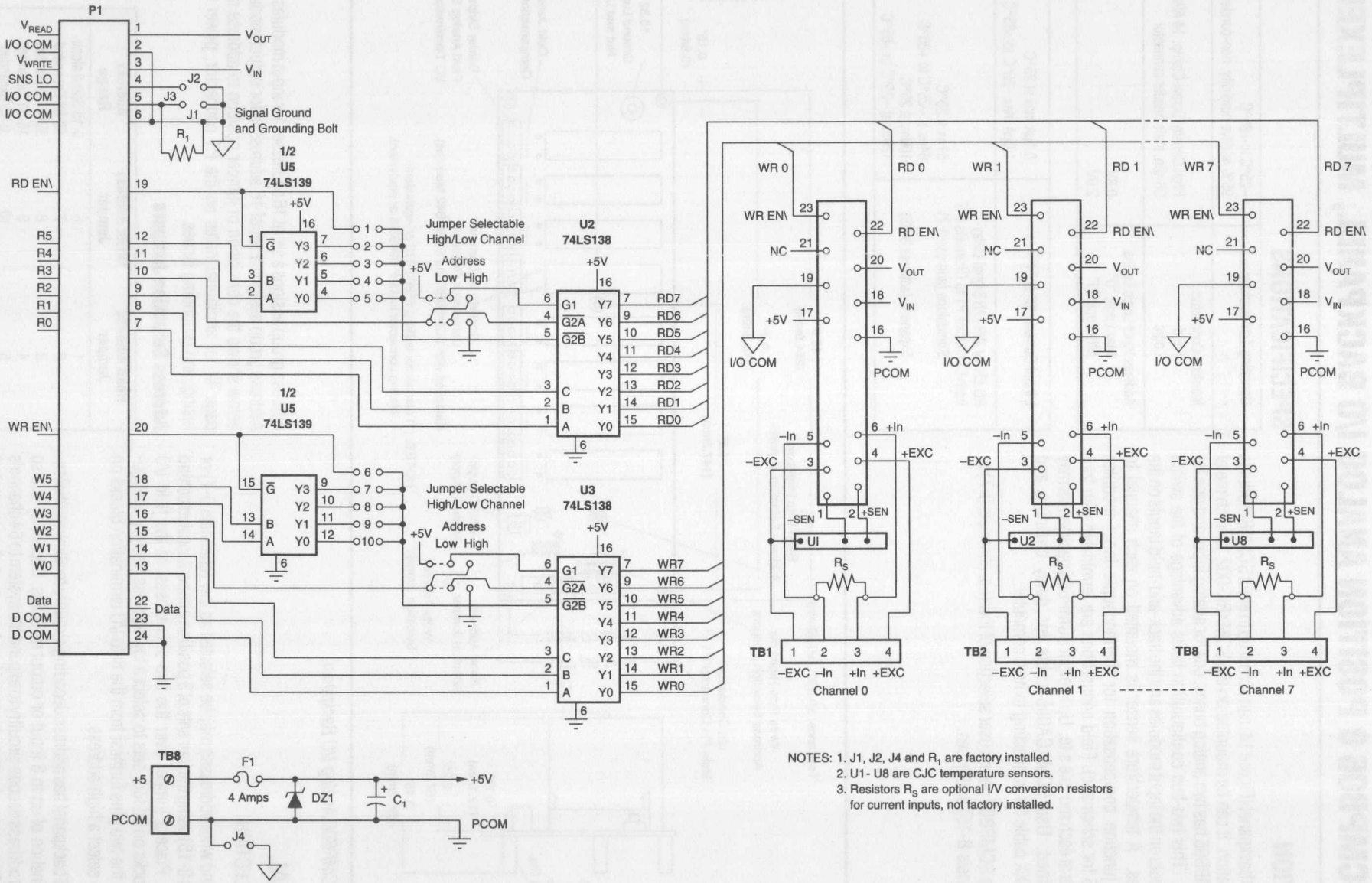
ADDRESS SELECTION

Module read and write addresses may be selected as low (channels 0-7) or high (channels 8-15) using the four sets of 3 position jumpers located behind connector P1. Place a jumper over the two pins closest to the field I/O termination blocks on all four sets to select a low address (factory configuration) or over the two pins furthest from the field I/O termination blocks on all four sets to select a high address.

The SCMPB06 backpanel has address decoding circuitry to allow multiplexing any combination of up to 8 input or output modules. Capability is also provided in the address decode circuitry to expand the system to 64 channels (eight SCMPB06 backpanels) of multiplexed input or output. Jumpers select which set of 16 addresses are assigned to a particular backpanel. The Read Address group assigns a set of 16 addresses for input modules, and the Write Address group assigns a set of 16 addresses for output modules. The table below shows the correlation of jumper position to address range. Refer to page 42 for additional notes on the P1 connector, power requirements, fusing, and grounding issues.

Address Selection Jumpers

Read Address Jumper	Write Address Jumper	Address Range
1	6	0-15 Stand alone
2	7	48-63 Expanded
3	8	32-47 Expanded
4	9	16-31 Expanded
5	10	0-15 Expanded



NOTES: 1. J1, J2, J4 and R_1 are factory installed.
2. U1 - U8 are CJC temperature sensors.
3. Resistors R_S are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 15. SCMPB06 Schematic.

SCMXRK-002 19 INCH METAL MOUNTING RACK

DESCRIPTION

The SCMXRK-002 is a 19-inch metal rack for mounting the SCMPB01/02/05/06 backpanels. It also provides capability to mount the SCMXPRT-003 or SCMXPRE-003 power supplies, and the SCMXIF interface board (See Figure 16 for dimensions).

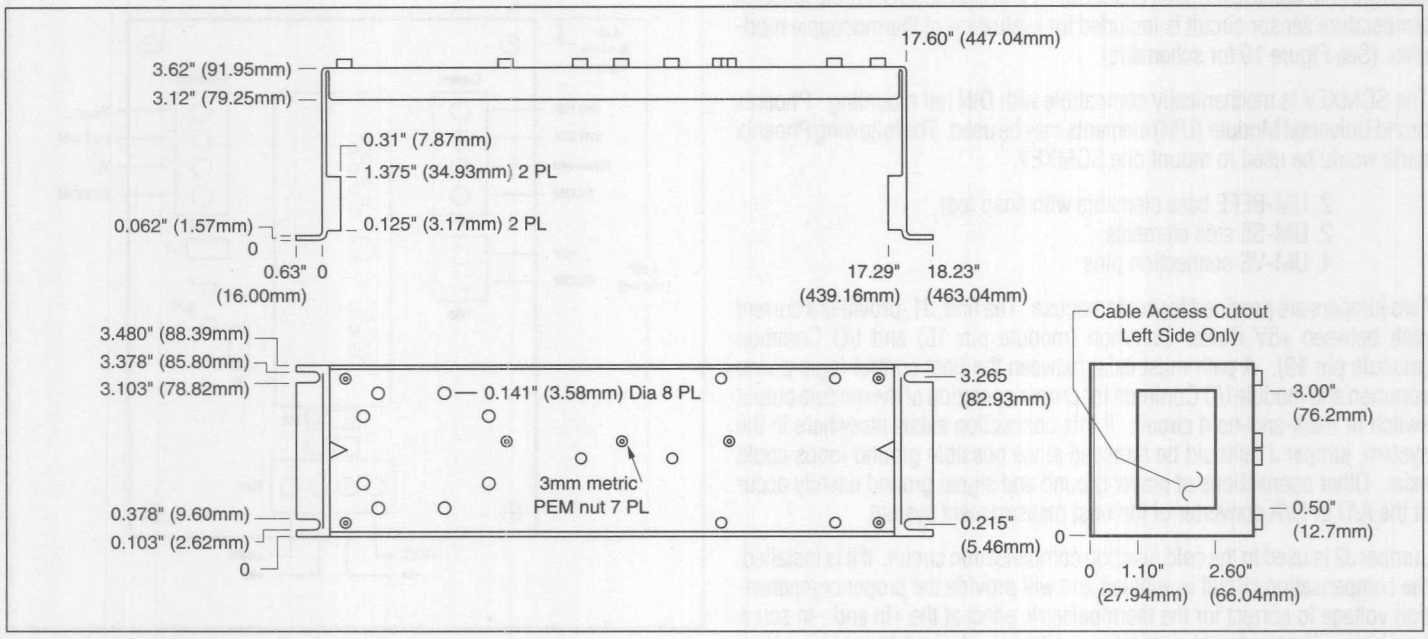


FIGURE 16. SCMXRK-002 Analog Rack Dimensions.

SCMXIF UNIVERSAL INTERFACE BOARD

DESCRIPTION

The SCMXIF is a universal interface board which converts a 26-pin ribbon cable input to 26 screw terminals for discrete wire. It can be mounted on the back of the SCMXRK-002 mounting rack; standoffs and mounting hardware are included. Use SCMXCA004-XX cable (See Figure 17 for dimensions).

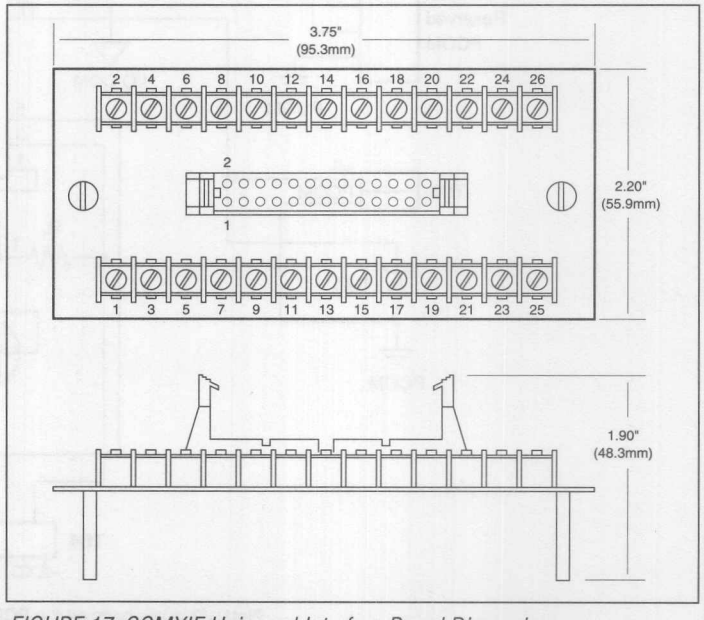


FIGURE 17. SCMXIF Universal Interface Board Dimensions.

DESCRIPTION

The SCMXEV is a single channel board with a test socket for SCM5B module evaluation (Figure 18). All signal input/output, control, and power connections are connected to terminal blocks for ease of user access. A cold junction temperature sensor circuit is included for evaluation of thermocouple modules. (See Figure 19 for schematic).

The SCMXEV is mechanically compatible with DIN rail mounting. Phoenix brand Universal Module (UM) elements may be used. The following Phoenix parts would be used to mount one SCMXEV.

2, UM-BEFE base elements with snap foot
2, UM-SE side elements
4, UM-VS connection pins

Two jumpers are provided for customer use. The first, J1, provides a current path between +5V Power Common (module pin 16) and I/O Common (module pin 19). A path must exist between the host control logic power common and module I/O Common for proper operation of the module output switch or track-and-hold circuit. If this connection exists elsewhere in the system, jumper J1 should be removed since possible ground loops could exist. Other connections of power ground and signal ground usually occur at the A/D or D/A converter of the host measurement system.

Jumper J2 is used in the cold junction compensation circuit. If it is installed, the compensation circuit is enabled and will provide the proper compensation voltage to correct for the thermoelectric effect at the +In and –In screw terminals. If an external simulation voltage is desired for cold junction compensation, J2 should be removed. The external voltage is applied at the sockets labled CJC+ and CJC–. An external voltage of 510.0 mV corresponds to an ambient temperature of +25 °C. The transfer function of the onboard compensation circuit is $V_{CJC} = 0.510 - 0.0025(T-25)V$.

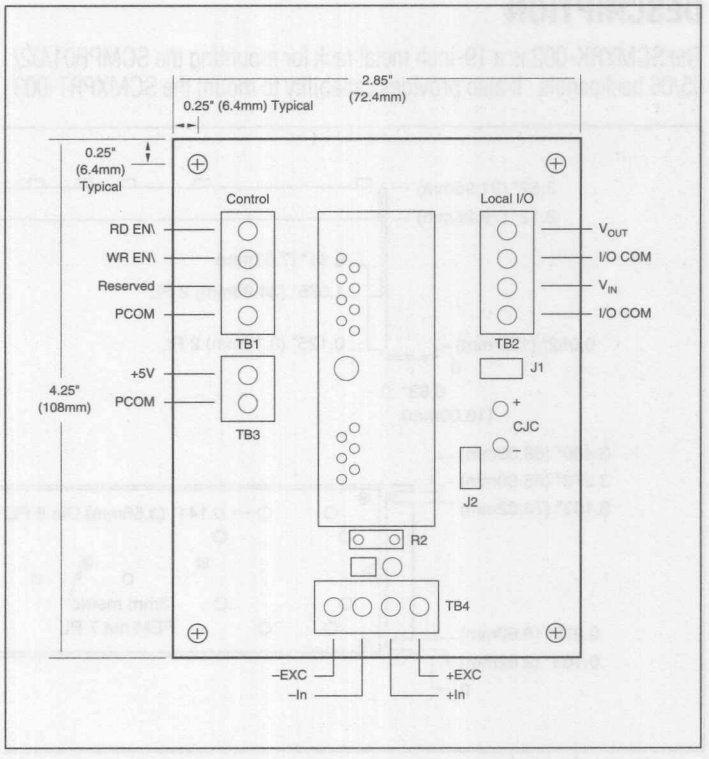
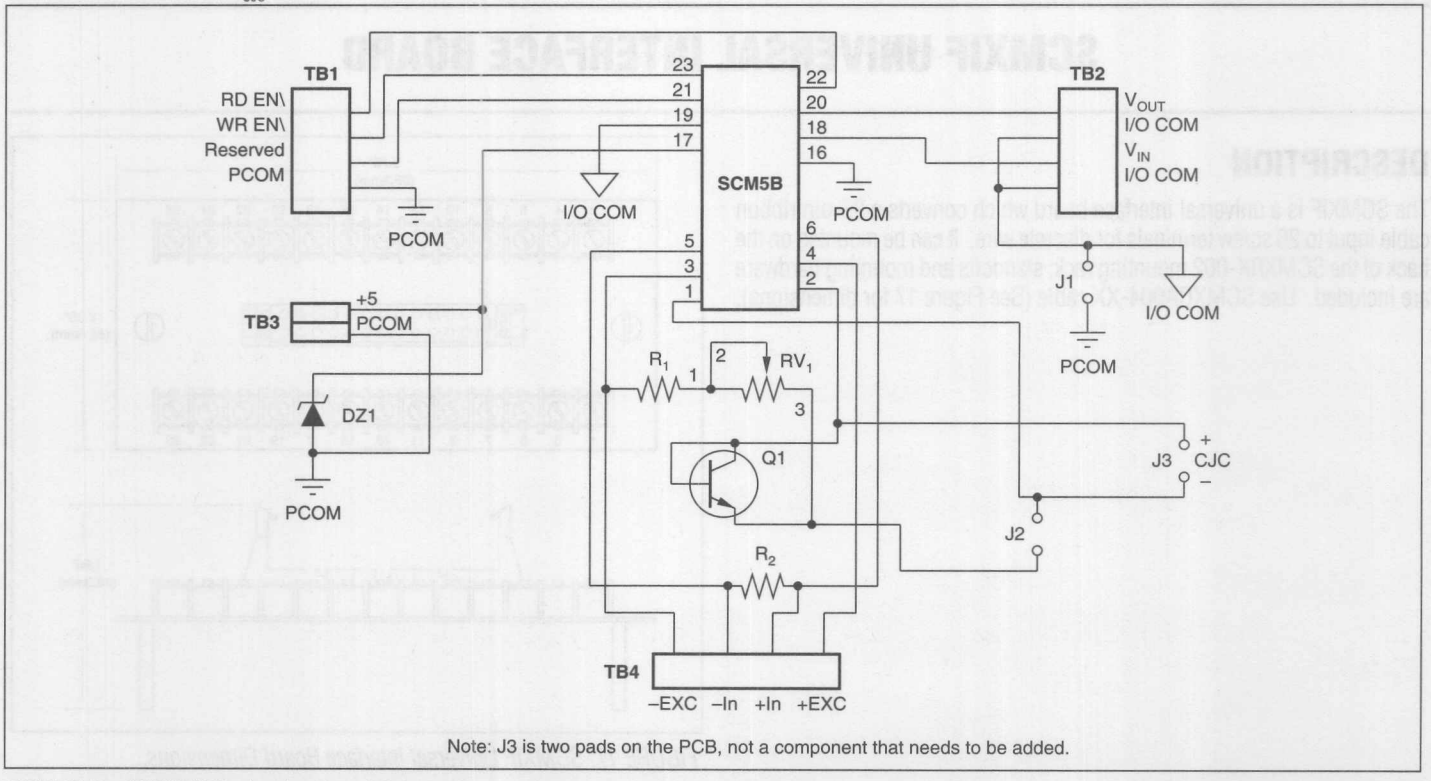


FIGURE 18. SCMXEV Evaluation Board Dimensions And Pin Layout.



Note: J3 is two pads on the PCB, not a component that needs to be added.

FIGURE 19. SCMXEV Evaluation Board Schematic.

SCMXCA004-XX, SCMXCA005 INTERFACE CABLES

DESCRIPTION

SCMXCA004-XX

System interface cable for the SCMPB01/02/05/06 backpanels. This is a 26 conductor ribbon cable with a mass-terminated socket connector installed on each end. It can be ordered in any length; -xx denotes required length in meters (Figure 20).

SCMXCA005

Daisy-chain cable for the SCMPB02/06 backpanels (Figure 21). Provides interconnection between a maximum of four SCMPB02 and eight SCMPB06 backpanels (See Figure 22).

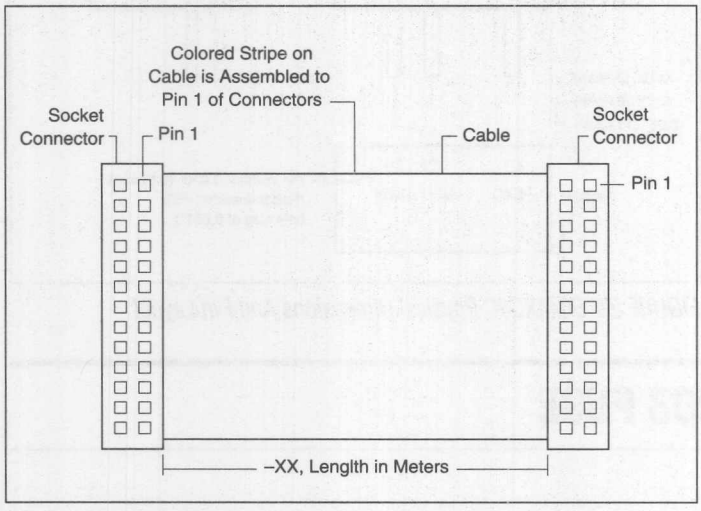


FIGURE 20. SCMXCA004-XX System Interface Cable.

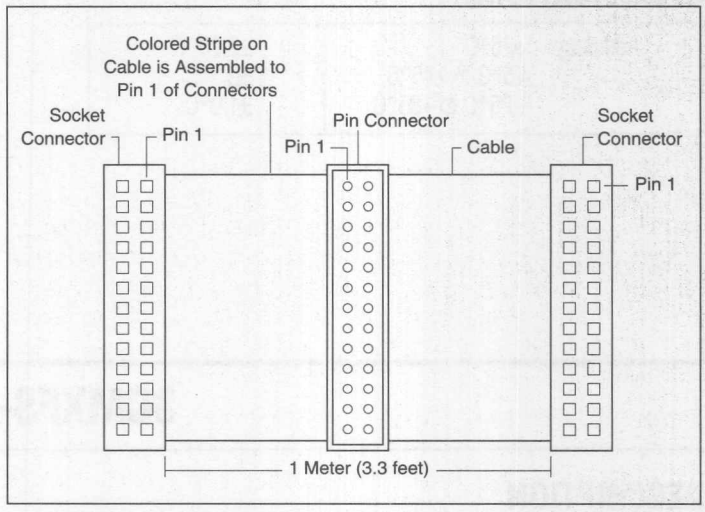


FIGURE 21. SCMXCA005 Daisy-Chain Cable.

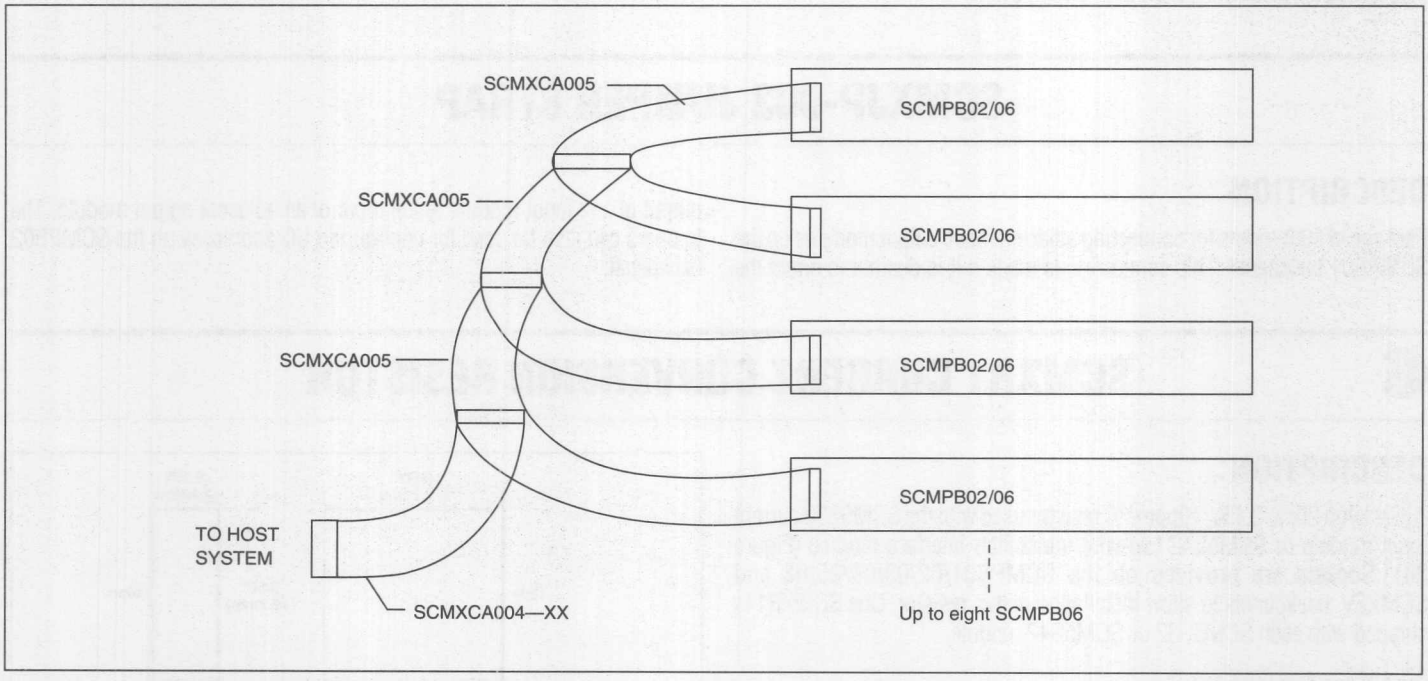


FIGURE 22. Application Of SCMXCA005 Daisy-Chain Cable.

SCMXCJC ENCAPSULATED COLD JUNCTION COMPENSATION

DESCRIPTION

The SCMXCJC is the identical circuit used on the SCMPB01/02/03/04/05/06 backpanels except it is packaged as a component for use in customer designed mounting boards (Figure 23). When interfaced to an SCM5B37 or 47 module the transfer function of the voltage across the +SEN and –SEN pins is $V_{CJC} = 0.510 - 0.0025(T - 25)V$.

SPECIFICATIONS

Accuracy	+25°C	±0.25°C
	+5°C to +45°C	±0.5°C
	–25°C to +85°C	±1.0°C

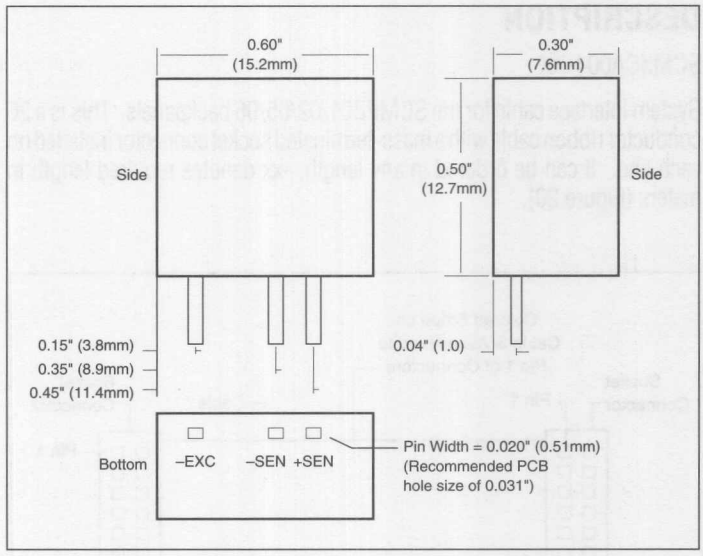


FIGURE 23. SCMXCJC Physical Dimensions And Pin Layout.

SCMXFS-003 FUSE

DESCRIPTION

Package of 10, 4 amp fuses for use on the SCMPB01 or SCMPB02 backpanel. This is a series fuse in the five volt power line. It provides protection against inadvertent reverse connection of five volt power.

SCMXJP-003 JUMPER STRAP

DESCRIPTION

Package of 10 jumpers for connecting adjacent input/output modules on the SCMPB01 backpanel. This connection is made if it is desired to direct the output of any input module to the input of an adjacent output module. The jumpers can also be used for configuring I/O addresses on the SCMPB02 backpanel.

SCMXR1 CURRENT CONVERSION RESISTOR

DESCRIPTION

A precision 20Ω, 0.1%, 10ppm/°C resistor used with the SCM5B32 current input module or SCM5B42 two-wire transmitter interface module (Figure 24). Sockets are provided on the SCMPB01/02/03/04/05/06 and SCMXEV backpanels to allow installation of this resistor. One SCMXR1 is shipped with each SCM5B32 or SCM5B42 module.

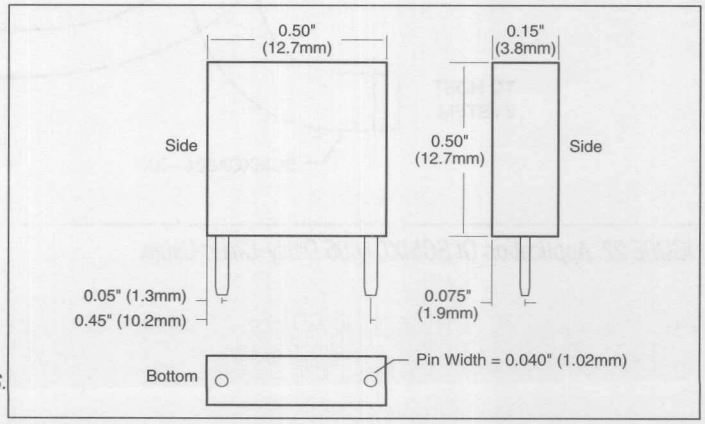


FIGURE 24. SCMXR1 Physical Dimensions.

SCMXPRE-003, SCMXPRT-003 POWER SUPPLIES

DESCRIPTION

Two power supplies are offered for the analog backpanels. These supplies are available in 120VAC or 220VAC input. They have sufficient output current capacity to supply any combination of SCM5B modules. The SCMXRK-002 metal rack provides mounting capability for the SCMXPRT/E-003 power supplies (See Figure 25).

SPECIFICATIONS

	SCMXPRT-003	SCMXPRE-003
Input Voltage Range	104-132VAC	207-265VAC
Output Voltage	5VDC	5VDC
Output Current(at +70C)	3A	3A
Operating Temp	0 to +70°C	0 to +70°C
Dielectric Withstand Voltage (input to ground)	3750VAC	3750VAC
Line Regulation (10% line change)	±0.05%	±0.05%
Load Regulation (50% load change)	±0.05%	±0.05%
Output Ripple (max)	5 mV_{P-P}	5 mV_{P-P}
Overvoltage Protection (factory set)	6.2 V ±0.4V	6.2 V ±0.4V

Both supplies are tested and certified by TUV to VDE 0806 and IEC 380. They are UL Recognized (File Number E55974) and CSA Certified (CSA File Number LR38879).

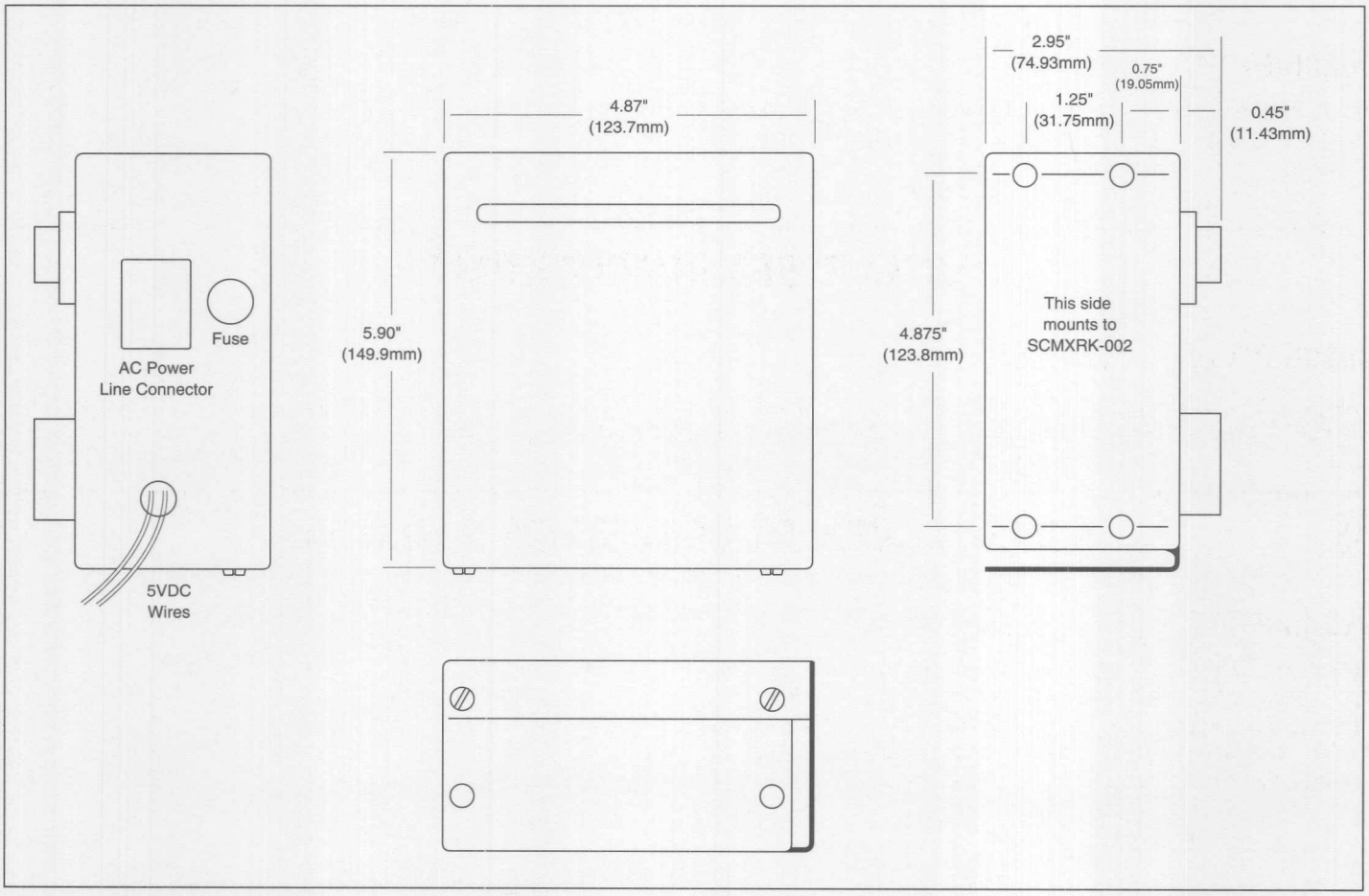


FIGURE 25. SCMXPRT-003/E-003 Physical Dimensions.

SCM APPLICATION NOTES

AN501	SCM5B37 THERMOCOUPLE VOLTAGE-TO-TEMPERATURE CONVERSION METHOD
AN502	GROUND CONNECTIONS AND HOST SYSTEM INTERFACE FOR SCM5B MODULES
AN503	SCM5B FAILURE RATE CALCULATION AND PREDICTION
AN504	INTERPRETING DRIFT SPECIFICATIONS
AN505	HARDWARE LINEARIZATION OF NON-LINEAR SIGNALS

AN 501: SCM5B37 Thermocouple Voltage-To-Temperature Conversion Method

When the SCM5B37 thermocouple modules are used to measure temperature, the measured output voltage must often be converted back to temperature. This is readily done with the SCM5B37 series because cold junction compensation is incorporated into the module and the SCMPB backpanels.

The method is illustrated here with an example.

A type "K" thermocouple is to be used with the SCM5B37K.

SCM5B37K input and output ranges:	Temperature Input	Voltage Output
	-100°C	0VDC
	+1350°C	+5VDC

1. From the type "K" thermocouple tables we find the following voltages:

   -100°C = -3.553mV

   +1350°C = 54.125mV

   The SCM5B37K module gain (G), is given by:

   $G = V_{out}$ full scale range / Thermocouple full scale range in volts

   Therefore: $G = 5 / [0.054125 - (-0.003553)] = 86.69$ V/V.

2. Calculate the effective thermocouple input voltage (V_t) from the measured output voltage (V_{out}) by the following formula:

   $V_t = (V_{out}$ measured / G) + Thermocouple neg. full scale in volts

   Therefore: $V_t = (V_{out} / 86.69) + (-0.003553)$

3. Find the value of the field temperature being measured by crossing V_t to thermocouple temperature in your application program's thermocouple lookup table.

   Gains for other SCM5B37 thermocouple modules are shown in the following table.

Module type	Range (°C)	Module Gain G (V/V)	Thermocouple Neg. Full Scale (mV)
SCM5B37J	-100 to 760	105.14	-4.632
SCM5B37K	-100 to 1350	86.69	-3.553
SCM5B37T	-100 to 400	206.21	-3.378
SCM5B37E	0 to 900	72.69	0.0
SCM5B37R	0 to 1750	239.49	0.0
SCM5B37S	0 to 1750	270.21	0.0
SCM5B37B	0 to 1800	368.05	0.0

For example, the following formula and values would be used for a type "J" thermocouple:

$V_t = (V_{out} / 105.14) - 0.004632$.

Where V_{out} is the module output voltage in volts and V_t is the thermocouple voltage referenced to a 0°C cold junction; that is, the voltage given in published tables.

AN 502: SCM5B
Ground Connections and Host System Interfaces

Use of the ground jumper arrangement on the SCMPB01 and SCMPB02 backpanels depends on the particular host analog-to-digital converter (ADC) system connected to the backpanels and SCM5B modules. This application note details four common system interface schemes; more than these could exist. The SCMPB02 multiplexing backpanel is used as the example rather than the SCMPB01 because it has more logic circuitry which depends on proper interface schemes. However, most of the following notes are applicable to both.

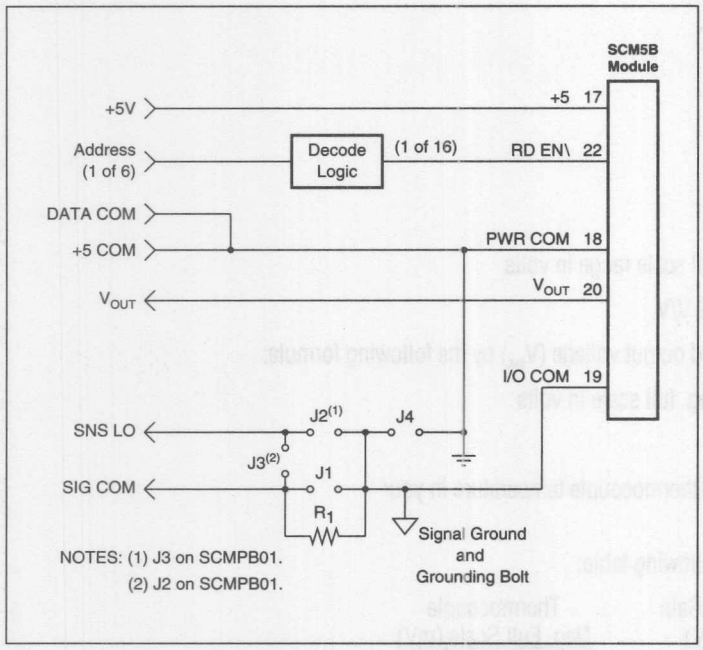


FIGURE1: Ground Connection Application for SCMPB02

CASE 1: Factory Configuration:

J1, J2, J4 installed

J3, R1 out

This is a general purpose configuration which may be used with single-ended or differential ADC systems. For single-ended ADC systems, connect the ADC positive input to V_{OUT} and ADC signal common and any shield line to SNS LO. Multiple SCMPB02 backpanels are connected together using SIG COM.

For differential ADC systems, connect the ADC positive input to V_{OUT} and negative input and shields to SNS LO. Multiple backpanels are connected together using SIG COM. Note that in this case SIG COM and SNS LO are shorted together and may be used interchangeably.

CASE 2: Remote Digital and Analog Common Connection:

J1, J2 installed

J3, J4, R1 out

Data common and analog common are usually connected at only one point in the system. This eliminates the feared ground loop. Normally, the best single point to connect grounds is close to the ADC. Many systems absolutely require this connection be made as close to the ADC as possible. In this case, J4 is removed in order to allow DATA COM and SIG COM to be connected remotely. SIG COM should be connected to the ADC signal common and to the SIG COM of other SCMPB02 backpanels. SNS LO is then connected to the ADC systems negative input. For differential multiplexers, SNS LO should be the multiplexed negative input.

CASE 3: Pseudo Ground for Offset Adjustment:

J3, J4, R1 installed

J1, J2 out

In this case, R1 is used as a voltage dropping resistor to create the possibility of an offset voltage for the ADC system. DATA COM and I/O COM should be within 0.2 volts of each other to allow the read select logic (RD EN\) to operate correctly. This assumes the read select logic of the system is referenced to power common. The SCM5B modules are transformer isolated between PWR COM and I/O COM (50 volts maximum). However, RD EN\ is referenced to I/O COM. For this reason I/O COM should be within 0.2 volts of the system digital common. This 0.2 volts could be exceeded, but noise margin is reduced accordingly. R1 will allow this small offset voltage to exist. Recommended value of R1 is 100 ohms. Values up to 10K ohm may be used in quiet electromagnetic conditions.

CASE 4: Ground Loop Break:

J2, J4, R1 installed

J1, J3 out

In some systems, it may be desired to break the signal common ground loop of multiple backplanes with resistances. R1 may be used for this. A recommended value is 100 ohms. SNS LO should be multiplexed into the ADC negative input.

AN503: SCM5B
Failure Rate Calculation And Prediction

Failure rate calculations for the SCM5B modules are derived from the MIL-HDBK-217E specification. The stress-analysis method is used at ground benign environment, 35°C temperature, and quality level of B-2 to D-1 depending on the part. Our specified humidity level is 95% RH noncondensing.

MODEL	FAILURES/10^6 HRS	MTBF (HRS)
SCM5B30/31/32/37-xx	1.54	650,000
SCM5B40/41-xx	1.46	680,000
SCM5B38/39/42/49-xx	1.35	740,000
SCM5B34/35/36-xx	1.48	675,000
SCM5B47-xx	1.50	670,000
SCMPB01, 05	1.83	546,000
SCMPB02, 06	2.16	463,000
SCMPB03	0.19	5,150,000
SCMPB04	0.23	4,430,000

Estimated actual failure rates are predicted to be much lower due to 100% powered burn-in for 48 hours at 85°C. The typical measured failure rate for the 5B modules is 0.34 failures per 10^6 hours (2,900,000 hours MTBF).

AN 504: Interpreting Drift Specifications

I. SCM5B30-XX, SCM5B31-XX, SCM5B40-XX and SCM5B41-XX

Read the drift specifications under the "Stability" heading on the appropriate spec sheet. Determine the overall gain of the module by dividing the output range by the input range.

1. Calculating Offset Drift—Multiply the input offset drift spec by the module gain and add the output offset drift spec.
2. Calculating Gain Drift—Multiply the gain drift spec by the output range of the module. (For worst case analysis, the module is operated at plus or minus full scale output.)
3. Calculating Total Drift—Total Drift = Offset Drift + Gain Drift (For worst case analysis, drift numbers are additive. Therefore, all terms carry the same sign.)

To determine the drift in volts at a given temperature (°C), subtract 25°C (ambient) from the temperature, then multiply by the offset drift, gain drift or total drift calculated above.

EXAMPLE #1: **SCM5B30-03**

Input Offset	=	±1V/°C
Output Offset	=	±20µV/°C
Gain	=	±25ppm/°C

Module Gain = [+5V - (-5V)] / [+100mV - (-100mV)] = 50

Offset Drift	=	(±1µV/°C)(50V/V) + (20µV/°C)	=	±70µV/°C
Gain Drift	=	(±25ppm/°C)(10V)	=	±250µV/°C
Total Drift	=	±70µV/°C + ±250uV/°C	=	±320µV/°C

Worst case drift at 85°C:

Offset Drift(85°C)	=	(±70µV/°C)(85 - 25°C)	=	±4.2mV
Gain Drift(85°C)	=	(±250µV/°C)(85 - 25°C)	=	±15.0mV
Total Drift(85°C)	=	(±320µV/°C)(85 - 25°C)	=	±19.2mV

II. SCM5B37X and SCM5B47X-XX

Read the drift specifications under the "Stability" heading and the Cold Junction Compensation accuracy from the appropriate spec sheet. Using thermocouple tables to convert the input range to volts, determine the module gain (V/V) by dividing the output range by the input range. Look up the Seebeck Coefficient for the thermocouple type under consideration.

The procedure for calculating drift is the same as in Section I with the exception of adding in the CJC accuracy.

1. Calculating CJC Accuracy—For $T_{ambient}$ = 25°C, multiply the accuracy (±0.25°C) by the Seebeck Coefficient and the module gain. For 5°C < $T_{ambient}$ < 45°C, multiply the accuracy (±0.5°C) by the Seebeck Coefficient and the module gain. Add this term to the Offset Drift as calculated in Section I.

EXAMPLE #2: **SCM5B37K**

Input Offset	=	±1µV/°C
Output Offset	=	±20µV/°C
Gain	=	±25ppm/°C
CJC Accuracy	=	±0.25°C at 25°C; ±0.50°C 5°C to 45°C

Type K Thermocouple	-100°C —>	-3.553mV
	+1350°C —>	+54.125mV
	Seebeck Coef.	40.44µV/°C

Module Gain = [+5 - 0V]/[54.125 - (-3.553mV)] = 86.69 V/V

Offset Drift = (±1µV/°C)(86.69) + (20µV/°C) ±0.50°C(40.44µV/°C)(86.69) = ±106.7µV/°C ±1.75mV

Gain Drift = (±25ppm/°C)(5V) = ±125µV/°C

Total Drift = ±106.7µV/°C ±125µV/°C ±1.75mV= ±231.7µV/°C ±1.75mV

III. SCM5B32-XX

The procedure for calculating drift is the same as in Section I with the exception of adding the drift of the supplied input resistor

Add the following term to the Offset Drift:

1. (±10ppm/°C)(20Ω)(I_z*)(Gain)

Add the following term to the Gain Drift:

1. (±10ppm/°C)(20Ω)(I_{fs})(Gain)

* I_z is the input current which results in zero output.

AN 505: Hardware Linearization of Non-linear Signals

Many sensors used in industry exhibit a deviation from an ideal (linear) relationship between input and output. For example, a given change in temperature does not give rise to the same change in emf for most thermocouples when measured over different temperature ranges. Sensors or signals which exhibit this behavior are said to be non-linear. A hypothetical non-linear transfer function is shown in Figure 1.

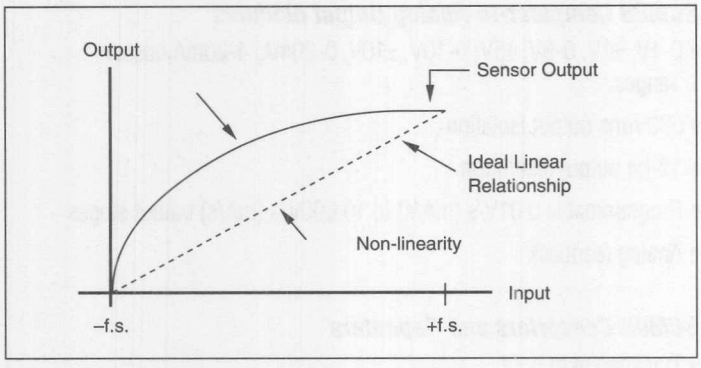


FIGURE1: Hypothetical Sensor Non-linearity.

Several of the SCM5B series modules have the capability of creating a non-linear transfer function through the module itself. This non-linear transfer function is configured at the factory and is designed to be equal and opposite to the sensor or signal non-linearity. The net result is that the module output signal is linear with respect to a given input parameter such as temperature. An output signal which has been linearized with hardware internal to the SCM5B modules is beneficial to the customer because it eliminates the need for tedious software routines which determine a linearized signal through the use of high-order polynomials or look-up tables.

A hardware piece-wise linear technique is used in the SCM5B modules to correct the non-linearity of the signal. The difference between the sensor non-linearity and the linearization provided by the SCM5B module is called the Conformity Error. This is a description of how well the

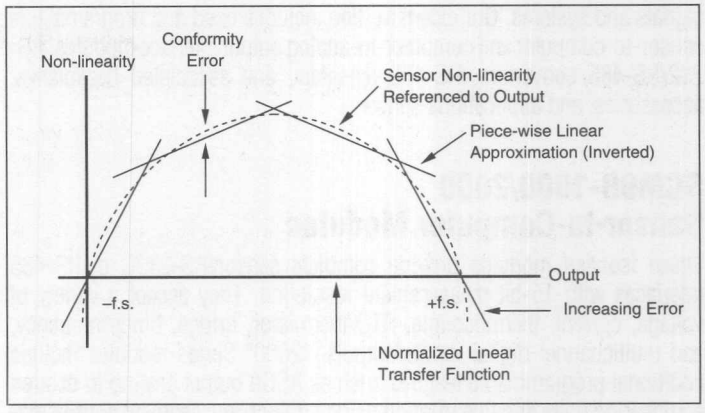


FIGURE 2: Normalized Plot.

linearization technique 'conforms' to the non-linear curve. Breakpoints are placed along the curve so as to equalize the positive and negative conformity errors. SCM5B modules have the capability of using 9 breakpoints (or 10 segments) to correct non-linearity which allows typical conformity of ±0.015% span. A normalized plot of sensor non-linearity and hardware linearization is shown in Figure 2.

Linearization of a given input is based upon the input minimum and maximum values. For any input within these limits, the output of the module will be a linear representation of the input. If the input exceeds the minimum or maximum values, the output of the module is no longer a linear representation of the signal. This is shown in Figure 2. Operation of an SCM5B module beyond the specified input span is not recommended because the output is difficult to calculate. If a standard module input span does not meet customer requirements a custom module can be easily designed for optimum performance in a given system. Consult the factory for details on custom SCM5B modules.

Isolated, Intelligent SCM9B Signal Conditioning Products

Dataforth offers high quality SCM9B products providing cost-effective protection and conditioning for a wide range of valuable industrial control signals and systems. Our extensive line includes fixed and programmable sensor-to-computer and computer-to-analog output interface modules, RS-232/RS-485 converters, RS-485 repeaters, and associated backplanes, accessories, and applications software.

SCM9B-1000/2000 Sensor-to-Computer Modules

These isolated modules provide complete sensor/RS-232C or/RS-485 interfaces with 15-bit measurement resolution. They accept a variety of voltage, current, thermocouple, RTD/thermistor, bridge, timer/frequency, and multichannel digital inputs/outputs. "2000" Series modules include additional programmable features such as ASCII output scaling to desired engineering units and linearization using straight-line segment approximation.

SCM9B-3000/4000 Computer-to-Analog Output Modules

These are complete, isolated interfaces designed for remote installation and communications with host computers via standard RS-232C and RS-485 serial ports. They offer 12-bit resolution in a range of analog output voltages and currents. "4000" series modules have fully programmable output slopes, true analog readback, and data scaling.

SCM9B-A1000/2000 Converters and Repeaters

These products convert RS-232C communications signal levels to the correct RS-485 signal requirements, and may also be configured as repeaters to extend communications bus lengths. They are optically isolated, require no external control signals, and are completely transparent to host software.

Key Specifications

SCM9B Sensor-to-Computer Modules

- 500Vrms input isolation
- Programmable scaling and linearization
- ASCII command/response protocol
- 15-bit measurement resolution
- Continuous self-calibration

SCM9B Computer-to-Analog Output Modules

- 0-1V, ±1V, 0-5V, ±5V, 0-10V, ±10V, 0-20mA, 4-20mA output ranges
- 500Vrms output isolation
- 12-bit output resolution
- Programmable 0.01V/s (mA/s) to 10,000V/s (mA/s) output slopes
- Analog readback

SCM9B Converters and Repeaters

- Transparent to host
- Optically isolated bidirectional data flows
- Automatic internal RS-485 bus supervision

Applications

- Process monitoring and control
- Remote data logging
- Product testing
- Motion and motor speed control
- Modem interfacing
- Portable data acquisition systems

SELECTION GUIDE FOR SCM9B ISOLATED, INTELLIGENT SIGNAL CONDITIONING PRODUCTS

SCM9B-1000/2000 SENSOR-TO-COMPUTER PRODUCTS

("2000" SERIES PRODUCTS HAVE USER-PROGRAMMABLE FEATURES)

MODEL	INPUT RANGE/OUTPUT
Voltage Inputs	
SCM9B-1101/2101	±10mV Input/RS-232C Output
SCM9B-1102/2102	±10mV Input/RS-485 Output
SCM9B-1111/2111	±100mV Input/RS-232C Output
SCM9B-1112/2112	±100mV Input/RS-485 Output
SCM9B-1121/2121	±1V Input/RS-232C Output
SCM9B-1122/2122	±1V Input/RS-485 Output
SCM9B-1131/2131	±5V Input/RS-232C Output
SCM9B-1132/2132	±5V Input/RS-485 Output
SCM9B-1141/2141	±10V Input/RS-232C Output
SCM9B-1142/2142	±10V Input/RS-485 Output
SCM9B-1151/2151	±100V Input/RS-232C Output
SCM9B-1152/2152	±100V Input/RS-485 Output
Current Inputs	
SCM9B-1211/2211	±10mA Input/RS-232C Output
SCM9B-1212/2212	±10mA Input/RS-485 Output
SCM9B-1221/2221	±1mA Input/RS-232C Output
SCM9B-1222/2222	±1mA Input/RS-485 Output
SCM9B-1231/2231	±100mA Input/RS-232C Output
SCM9B-1232/2232	±100mA Input/RS-485 Output
SCM9B-1241/2241	±1A Input/RS-232C Output
SCM9B-1242/2242	±1A Input/RS-485 Output
SCM9B-1251/2251	4-20mA Input/RS-232C Output
SCM9B-1252/2252	4-20mA Input/RS-485 Output
Thermocouple Inputs	
SCM9B-1311	J Thermocouple Input/RS-232C Output
SCM9B-1312	J Thermocouple Input/RS-485 Output
SCM9B-1321	K Thermocouple Input/RS-232C Output
SCM9B-1322	K Thermocouple Input/RS-485 Output
SCM9B-1331	T Thermocouple Input/RS-232C Output
SCM9B-1332	T Thermocouple Input/RS-485 Output
SCM9B-1341	E Thermocouple Input/RS-232C Output
SCM9B-1342	E Thermocouple Input/RS-485 Output
SCM9B-1351	R Thermocouple Input/RS-232C Output
SCM9B-1352	R Thermocouple Input/RS-485 Output
SCM9B-1361	S Thermocouple Input/RS-232C Output
SCM9B-1362	S Thermocouple Input/RS-485 Output
SCM9B-1371	B Thermocouple Input/RS-232C Output
SCM9B-1372	B Thermocouple Input/RS-485 Output
SCM9B-1381	C Thermocouple Input/RS-232C Output
SCM9B-1382	C Thermocouple Input/RS-485 Output
RTD Inputs	
SCM9B-1411	.00385 RTD Input/RS-232C Output
SCM9B-1412	.00385 RTD Input/RS-485 Output
SCM9B-1421	.00392 RTD Input/RS-232C Output
SCM9B-1422	.00392 RTD Input/RS-485 Output
SCM9B-1431	.00388 RTD Input/RS-232C Output
SCM9B-1432	.00388 RTD Input/RS-485 Output
SCM9B-1451	2252Ω Thermistor Input/RS-232C Output
SCM9B-1452	2252Ω Thermistor Input/RS-485 Output
SCM9B-1461	TD Thermistor Input/RS-232C Output
SCM9B-1462	TD Thermistor Input/RS-485 Output
Bridge Inputs	
SCM9B-1511/2511	±30mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1512/2512	±30mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1521/2521	±30mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1522/2522	±30mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1531/2531	±100mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1532/2532	±100mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1541/2541	±100mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1542/2542	±100mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1551/2551	1-6V Bridge Input, 8V Excitation/RS-232C Output
SCM9B-1552/2552	1-6V Bridge Input, 8V Excitation/RS-485 Output
SCM9B-1561/2561	1-6V Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1562/2562	1-6V Bridge Input, 10V Excitation/RS-485 Output
Timer and Frequency Inputs	
SCM9B-1601/2601	Frequency Input/RS-232C Output
SCM9B-1602/2602	Frequency Input/RS-485 Output
SCM9B-1611/2611	Timer Input/RS-232C Output
SCM9B-1612/2612	Timer Input/RS-485 Output
SCM9B-1621	Event Counter/RS-232C Output
SCM9B-1622	Event Counter/RS-485 Output
SCM9B-1631/2631	Accumulator, Frequency Input/RS-232C Output
SCM9B-1632/2632	Accumulator, Frequency Input/RS-485 Output
SCM9B-1641/2641	Accumulator, Timer Input/RS-232C Output
SCM9B-1642/2642	Accumulator, Timer Input/RS-485 Output

MODEL	INPUT RANGE/OUTPUT
DIGITAL INPUTS/OUTPUTS	
SCM9B-1701	7 Digital Inputs, 8 Digital Outputs/RS-232C Output
SCM9B-1702	7 Digital Inputs, 8 Digital Outputs/RS-485 Output
SCM9B-1711	15 Digital Inputs and/or Outputs/RS-232C Output
SCM9B-1712	15 Digital Inputs and/or Outputs/RS-485 Output

SCM9B-3000/4000 COMPUTER-TO-ANALOG OUTPUT PRODUCTS

("4000" SERIES PRODUCTS HAVE USER-PROGRAMMABLE FEATURES)

MODEL	OUTPUT RANGE/INPUT
VOLTAGE OUTPUT	
SCM9B-3121/4121	±1V Output/RS-232C Input
SCM9B-3122/4122	±1V Output/RS-485 Input
SCM9B-3131/4131	±5V Output/RS-232C Input
SCM9B-3132/4132	±5V Output/RS-485 Input
SCM9B-3141/4141	±10V Output/RS-232C Input
SCM9B-3142/4142	±10V Output/RS-485 Input
SCM9B-3161/4161	0 to 1V Output/RS-232C Input
SCM9B-3162/4162	0 to 1V Output/RS-485 Input
SCM9B-3171/4171	0 to 5V Output/RS-232C Input
SCM9B-3172/4172	0 to 5V Output/RS-485 Input
SCM9B-3181/4181	0 to 10V Output/RS-232C Input
SCM9B-3182/4182	0 to 10V Output/RS-485 Input
Current Output	
SCM9B-3251/4251	0 to 20mA Output/RS-232C Input
SCM9B-3252/4252	0 to 20mA Output/RS-485 Input
SCM9B-3261/4261	4 to 20mA Output/RS-232C Input
SCM9B-3262/4262	4 to 20mA Output/RS-485 Input

SCM9B-H1700 Digital I/O Boards

MODEL	DESCRIPTION
SCM9B-H1750	24 Digital Inputs/Outputs
SCM9B-H1770	64 Digital Inputs/Outputs
SCM9B-HCA1	4 Ribbon Connector Assembly

SCM9B-A1000/A2000 Converters/Repeaters

MODEL	DESCRIPTION	
SCM9B-A1000-115	RS-232C/RS-485	Converter/Repeater, 115VAC
SCM9B-A1000-230	RS-232C/RS-485	Converter/Repeater, 230VAC
SCM9B-A2000	RS-232C/RS-485	Converter/Repeater, +10 to +30VDC

Accessories and Software

MODEL	DESCRIPTION
SCM9B-PB08	8 Channel Backpanel
SCM9B-PB14	14 Channel Backpanel
SCM9B-S1000	Series S1000/3000/4000 Utility Software
SCM9B-S1200	Data Logging Software for 1000/2000 Series Modules
SCM9B-S2000	Series S2000 Utility Software
MA-1001	User's Manual, SCM9B-1000
MA-1002	User's Manual, SCM9B-2000
MA-1003	User's Manual, SCM9B-3000/4000
MA-1004	User's Manual, SCM9B-1700

SCM9B-1000/2000 Series
Sensor-to-Computer Modules

FEATURES

- COMPLETE SENSOR TO RS-485 OR RS-232C INTERFACE.
- ASCII FORMAT COMMAND/RESPONSE PROTOCOL.
- 500V rms ANALOG INPUT ISOLATION.
- 15-BIT MEASUREMENT RESOLUTION.
- CONTINUOUS SELF-CALIBRATION; NO ADJUSTMENTS OF ANY KIND.
- PROGRAMMABLE DIGITAL FILTER.
- DIGITAL LIMIT SETTING AND ALARM CAPABILITY.
- DIGITAL INPUTS AND OUTPUTS CONNECT TO SOLID STATE RELAYS.
- EVENTS COUNTER TO 10 MILLION.
- REQUIRES +10V to +30Vdc UNREGULATED SUPPLY.
- TRANSIENT SUPPRESSION ON RS-485 COMMUNICATIONS LINES.
- SCREW TERMINAL PLUG CONNECTORS SUPPLIED.

PROGRAMMABLE FEATURES (2000 SERIES)

(Provides intelligent features not found in the 1000 series.)

- ASCII Output Scaled to Desired Engineering Units.
- User Programmable Nonlinear Transfer Function.
- Straight-line Segment Approximation: up to 24 segments.

DESCRIPTION

The SCM9B-1000/2000 Sensor-to-Computer Modules are a family of complete solutions designed for data acquisition systems based on personal computers and other processor-based equipment with standard serial I/O ports. The modules convert analog input signals to engineering units and transmit in ASCII format to any host with standard RS-485 or RS-232C ports. These modules can measure temperature, pressure, voltage, current and various types of digital signals. The modules provide direct connection to a wide variety of sensors and perform all signal conditioning, scaling, linearization and conversion to engineering units. Each module also provides digital I/O lines for controlling devices through solid state relays or TTL signals. These digital I/O lines along with built-in limit setting capability provide alarm and control outputs (see Figure 1).

The modules contain no pots or switches to be set. Features such as address, baud rate, parity, alarms, echo, etc. are selectable using simple commands over the communications port—without requiring access to the module. The selections are stored in nonvolatile EEPROM which maintains data even after power is removed.

With these modules, anyone familiar with a personal computer can construct a data acquisition system. This modular approach to data acquisition is extremely flexible, easy to use and cost effective. Data is acquired on a per channel basis so you only buy as many channels as you need. The modules can be mixed and matched to fit your application. They can be placed remote from the host and from each other. You can string up to 124 modules on one set of wires by using RS-485 with repeaters.

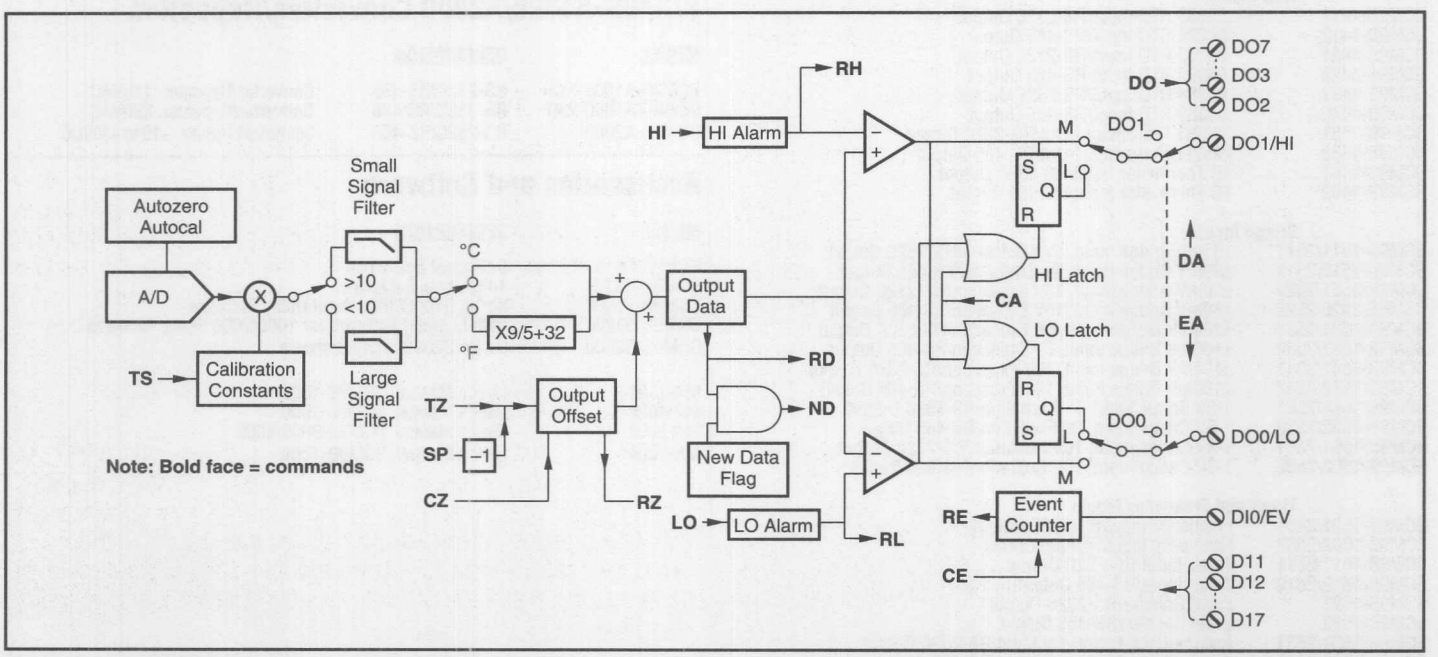


Figure 1. Block Diagram.

The 2000 series is an enhanced version of the 1000 series of sensor interfaces. The 2000 series allows the user to scale the output data in any desired engineering units. The 2000 also provides the ability to program nonlinear transfer functions. This feature may be used to linearize nonstandard sensors or to provide outputs in engineering units which are nonlinear functions of the input.

The 2000 can be programmed to approximate square law, root, log, high-order polynomial or any other nonlinear function. It may also be empirically field-programmed when the exact transfer function is unknown.

The 1000 and 2000 modules are isolated data acquisition systems for real-time distributed processing and control. By distributing computer power to each sensor location, the host computer is unburdened from interpreting data from sensor inputs. Instead of scaling and linearizing sensor data, the host computer can be used more efficiently to scan a greater number of inputs and to provide faster control output.

The 1000 and 2000 are compatible with 3000 and 4000 series and may be mixed in any combination. The 3000 and 4000 series convert ASCII format input commands to voltage or current output signals.

All modules are supplied with screw terminal plug connectors and captive mounting hardware. The connectors allow system expansion, reconfiguration or repair without disturbing field wiring. Their small size allows them to be mounted in virtually any location or position including explosion-proof housings and DIN rails.

Although software is not required, utility software (S1000/2000) is available on IBM-compatible diskette to make the 1000 and 2000 easier to learn and use. S1000/2000 software is provided at no charge on request with a purchase order and is not copy protected.

THEORY OF OPERATION

Each module is a complete single-channel data acquisition system. Each unit contains analog signal conditioning circuits optimized for a specific input type. The amplified sensor signals are converted to digital data with a microprocessor-controlled integrating A/D converter. Offset and gain errors in the analog circuitry are continuously monitored and corrected using microprocessor techniques. The 1000 converts the digital signal data into engineering units using look-up tables. The 2000 converts the digital signal data into engineering units using look-up tables that are customer-programmed. The resultant data is stored in ASCII format in a memory buffer. The modules continuously convert data at the rate of 8 conversions per second and store the latest result in the buffer. The host computer may request data by sending simple ASCII commands to the module. The 1000 will then instantly respond by communicating the ASCII buffer data back to the host. Up to 124 modules may be linked to a single RS-232C or RS-485 host computer port. Each module on a serial line is identified by a unique user-programmable address. This addressing technique allows modules to be interrogated in any order.

DIGITAL INPUTS/OUTPUTS

1000 and 2000 modules also contain up to three digital outputs and two digital inputs. The digital outputs are open-collector transistor switches that may be controlled by the host computer. These switches may be used to control solid-state relays which in turn may control heaters, pumps and other power equipment. The digital inputs may be read by the host computer and used to sense the state of a remote digital signals. They are ideal for sensing the state of limit or safety switches. Digital I/O capability may be expanded by using the 1700 series modules or H1750/H1770 boards.

EVENT COUNTER

With the exception of 1400 RTD, 1500 and 2500 bridge input modules, every module contains an onboard event counter. The event counter will count up to 10 million transitions that occur on the digital input. The event counter may be read and cleared by the host computer at any time. The counter has many applications where a host computer must read an accumulated count of events. It may be used in production line applications to keep a record of repetitious operations. For applications that only require counting, use the Event Counter modules (1621 and 1622). These modules have no analog input but count events up to 10 million at either 60Hz or 20KHz bandwidths.

For applications that require reading and accumulating pulse-type information use the Accumulator modules (163x/4x and 263x/4x). The Accumulators can read both the rate and the total count of a frequency or pulse input signal. They can keep track of power consumption when connected to a power meter or accumulate the output of pulse-type flow meters.

ALARM OUTPUTS

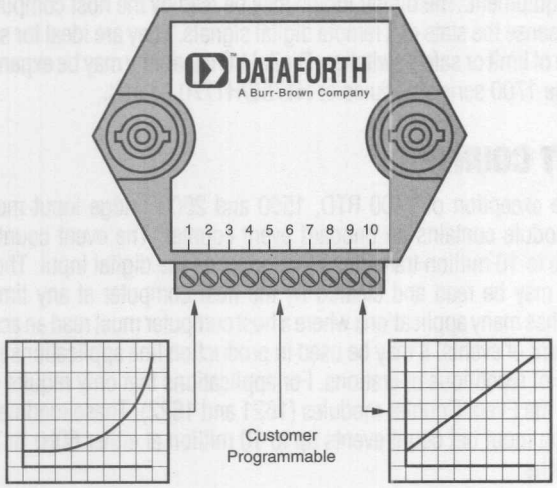
The 1000 and 2000 modules include digital high and low alarm functions. High and low alarm limits may be downloaded into the module by the host computer. The limit data is compared against the analog input data after every A/D conversion. The result of the limit comparison may be read by the host. The high and low limits may also be used to control the digital outputs on the module. The limits may be used to turn on alarms or to shut down a process independent of a host computer. Limit data may be changed at any time with commands from the host computer. Limit values are stored in nonvolatile memory to preserve the values even when module power is removed. Limit data is downloaded in the same engineering units as output data. Alarm outputs may be programmed to be latching to record the occurrence of a single alarm event. Alarm outputs may also be configured to form simple on-off controllers that are independent of the host computer.

USER OPTIONS

To provide maximum flexibility, the 1000 and 2000 offer a variety of user-selectable options including choice of address, baud rate, parity, alarm options, echo, etc. All options are selectable using simple commands over the communications port. All option selections are stored in a nonvolatile EEPROM which maintains data even after power is removed. The modules contain no pots or switches to be set. All options may be changed remotely without requiring access to the module.

DIGITAL FILTER

The 1000 and 2000 options include a unique programmable single pole digital filter. The filter is used to smooth analog data in noisy environments. Separate time constants may be specified for small and large signal changes. Typically a large time constant is specified for small signal changes to filter out noise and provide stable output readings. A smaller time constant may be chosen for large signal changes to provide fast response to such changes.



2000 SERIES PROGRAMMING

The outstanding feature of the 2000 series is its user-programmable output scaling. The transfer function from analog input to data output may be specified to an infinite spectrum of functions, both linear and nonlinear. Sensor data may be scaled to any desired engineering units for easy interpretation.

The 2000 uses a piece-wise linear technique to approximate nonlinear functions. Figure 2 shows this technique. The first step in programming a function is to establish the functions endpoints, as shown in Figure 2a. This is accomplished by using the Minimum (MN) and Maximum (MX) commands. In cases where only linear scaling is necessary, the programming task is now complete. For nonlinear functions, the linear curve may be broken into segments by describing a breakpoint using the BreakPoint (BP) command. The breakpoint establishes an intersection between two linear segments. Figures 2b & 2c show the effect of breakpoints.

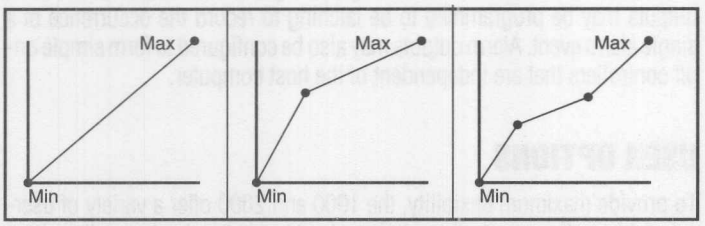


Figure 2. Piece-Wise Linear Technique.

Up to 23 breakpoints are available to define 24 linear segments. Only two restrictions apply to the shape of the programmed transfer function:

1. The output data value must be a single-valued function of the input.

2. The output values must lie between the limits set by the endpoints.

In general, breakpoints are defined by applying a known analog signal to the input of the module. This establishes the x-axis position of the breakpoint. The y-axis position is defined in the argument of the breakpoint (BP) command. The breakpoint data is stored in nonvolatile EEPROM. The transfer function may be reprogrammed many times.

RESOLUTION

All modules represent data in the same fixed format of sign, five digits, decimal point, and two more digits; +00100.00 for example. The user can structure the 2000 output data for the best compromise between resolution and readability. For example, a +0.05 volt output indication may be structured in three output formats:

Input Voltage	Output Format	Resolution
+0.05Volts	+00000.05	5
+50 millivolts	+00050.00	5,000
+50,000 microvolts	+50000.00	5,000,000

The microvolt output format extracts the best resolution but the output data will tend to be noisy. For a 0 to 0.05V output, millivolts is the best output format choice. This gives 5,000 counts of resolution in easy to interpret units.

In a typical application a 2000 module is used to output data in units of specific gravity. The specific gravity output range is between 0.5 and 2. If the output data format range is +0000.50 to +00002.00 there are only 150 counts of resolution between the minimum and maximum outputs. However, since the specific gravity of water is defined to be 1, the output may be scaled in percent. The specific gravity of water becomes 100 %. The output data range in % is from +00050.00 to +00200.00. This format allows up to 15,000 counts of resolution in easily interpreted units.

COMMAND SET

All SCM9B modules use a simple command/response protocol for communication. A module must be interrogated by the host to obtain data. A module can never initiate a command sequence. A typical command/response sequence could look like this:

Command: $1RD
Response: *+00075.00

A command is initiated with a command prompt, which may be a dollar sign ($) or a pound sign (#). Following the prompt a single address character must be transmitted. Each module on a communications bus must be setup with a unique address. The command is directed in this case to module address '1'. The address is followed by a two-character command which in this case is RD for Read Data. The command is terminated with a carriage return.

After module address '1' receives the command it will respond with the analog input data. The response begins with a response prompt, which is an asterisk (*). The data is read back in a standardized format of sign, 5 digits, decimal point, and 2 more digits. All modules represent data in the same standard format.

Table 1 shows all the 1000 and 2000 commands. For each case, a sample command and response is shown. Notice that some commands only respond with an * acknowledgment.

Table 1. 1000 and 2000 Series Command Set.

Command and Definition		Typical Command Message ($ prompt)	Typical Response Message
DI	Read Alarms/Digital Inputs	$1DI	*0003
DO	Set Digital Outputs	$1DOFF	*
ND	New Data	$1ND	*+00072.00
RD	Read Data	$1RD	*+00072.00
RE	Read Event Counter	$1RE	*0000107
RL	Read Low Alarm Value	$1RL	*+00000.00 L
RH	Read High Alarm Value	$1RH	*+00510.00 L
RS	Read Setup	$1RS	*31070142
RZ	Read Zero	$1RZ	*+00000.00
WE	Write Enable	$1WE	*
Write Protected Commands.			
CA	Clear Alarms	$1CA	*
CE	Clear Events	$1CE	*
CZ	Clear Zero	$1CZ	*
DA	Disable Alarms	$1DA	*
EA	Enable Alarms	$1EA	*
EC	Events Clear	$1EC	*0000107
HI	Set High Alarm Limit	$1HI+12345.67L	*
LO	Set Low Alarm Limit	$1LO+12345.67L	*
RR	Remote Reset	$1RR	*
SU	Setup Module	$1SU31070142	*
SP	Set Setpoint	$1SP+00600.00	*
TS	Trim Span	$1TS+00600.00	*
TZ	Trim Zero	$1TZ+00000.00	*
2000 Programming Commands (Write Protected).			
BP	Set Breakpoint	$1BP00-00200.00	*
EB	Erase Breakpoint Table	$1EB	*
MN	Set MinimumValue	$1MN-00200.00	*
MX	Set Maximum Value	$1MX+00750.00	*

For greater data security, options are available to echo transmitted commands and to send and receive checksums. The # command prompt requests a response message from the module that begins with an *, followed by the channel address, command, data (if necessary) and checksum. This response echoes the channel address and command for verification and adds checksum for error checking. Checksum is a two character hexadecimal value that can be added to the end of any command message, regardless of prompt, at your option. Checksum verifies that the message received is exactly the same as the message sent.

The modules perform extensive error checking on commands and will respond with an error message if necessary. For example:

Command: $1AB
Response: ?1 COMMAND ERROR

All error messages start with an error prompt (?) followed by the channel address and error description. In this case, the module did not recognize 'AB' as a valid command.

APPLICATIONS

Linear and nonlinear scaling

The 2000 can output data in easy-to-understand engineering units that may be instantly read and interpreted, without data conversion, by a host computer. For example, a pressure sensor provides a 1 to 5V linear output for pressures of 0 to 1000 psi. A 2131 module reads the sensor output in millivolts. But the real parameter of interest is pressure, not voltage, and voltage readings may be difficult to interpret. To make the output data more meaningful, program the 2131 output in psi:

Pressure (psi)	Sensor Output	2131 Output (mV)	2131 Output (psi)
0	1.0V	+01000.00	+00000.00
500	3.0V	+03000.00	+00500.00
1000	5.0V	+05000.00	+01000.00

In many cases, the desired output data is specific to an application. Assume that the same pressure sensor is used to measure the "fullness" of a pressure vessel, such as a cylinder of compressed air. The output units could be in units of "percent" and in this case we will assume that if the cylinder reads 750 psi it is 100% full:

Pressure (psi)	Sensor Output	2131 Output (%)
0	1.0V	+00000.00
375	2.5V	+00050.00
750	4.0V	+00100.00

The real power of the 2000 modules is their ability to provide output data in engineering units for nonlinear sensors. A nonlinear transfer function may be programmed into a 2000 module by approximating the curve with a series of linear segments, using the Break Point (BP) command. A Break Point specifies the intersection between two linear segments. Up to 23 Break Points may be used to specify 24 linear segments in a curve.

The following example uses a 2131 module to linearize the output of a pyrometer that uses an infrared temperature sensor. The infrared temperature sensor is inherently nonlinear and its output ranges from 0.717 to 1.406V for a temperature span of 600 to 1600°C.

Breakpoint	Input Voltage	Output Value
Minimum	+00717.00	+00600.00
00	+00844.00	+00700.00
01	+00948.00	+00800.00
02	+01036.00	+00900.00
03	+01110.00	+01000.00
04	+01174.00	+01100.00
05	+01230.00	+01200.00
06	+01280.00	+01300.00
07	+01325.00	+01400.00
08	+01367.00	+01500.00
Maximum	+01406.00	+01600.00

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Scaling a nonlinear transfer function in the field

Assume that a water tower with an irregular shape is 30 feet tall and holds about 10,000 gallons. A pressure sensor may be used to measure the height of the water in the tower (see Figure 3). The pressure sensor produces 0.1V per foot of water starting at 0V. To create a nonlinear function in the module, the end points must be set first. The minimum value is known and may be programmed by applying 0V to the module corresponding to 0 gallons. A "dummy" maximum value, which we know can never be exceeded, may be used to specify the maximum end point. In this case we apply +5V to the module and program the maximum value to be 15,000 gallons. Starting with an empty tower, read the pressure at fixed known volumes of water, every 1000 gallons for example, and set breakpoints in the module corresponding to known amounts of water in the tower. Once the curve is programmed, the module converts the pressure signal to gallons.

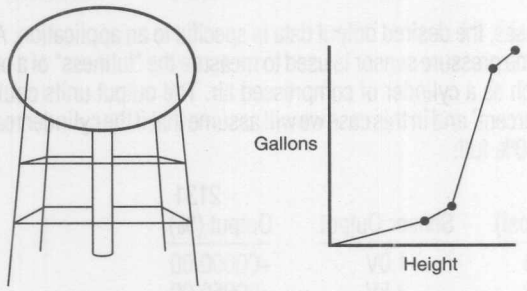


Figure 3. Scaling When the Exact Transfer Function is Unknown.

The preceding example shows that 2000 modules may be programmed in the field to specific test inputs where the actual nonlinearity is unknown. Since all programming is done through the communications port, access to a module is not necessary and ranging may be done remotely.

Scaling to desired engineering units

The 2000 allows you to scale an input to desired engineering units. For example, many sensor output signals are transmitted as 4 to 20mA signals. The following example demonstrates scaling a 4 to 20mA signal to 0 to 100% using a 2251 or 2252 module. The actual input range of these modules is 0 to 25mA to make it easier to adjust for zero and span and to allow for drift in the end points of the input (see Figure 4).

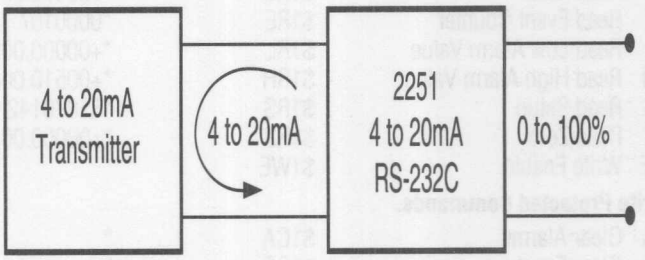


Figure 4. Scaling to Desired Engineering Units.

Since the input range is 0 to 25mA and you want to use a portion of that range, you must determine the new minimum and maximum values. The two desired values: 4mA, 0% and 20mA, 100% determines the desired transfer function. Extrapolate this function to the full-scale range of the module, which is 0-25mA. This results in end points at 0mA, –25% and 25mA, 131.25%.

Input the new minimum and maximum values with the following procedure. In these steps, we assume a channel address of 1.

1. Connect module to computer, or terminal and establish communications.
2. Apply 0mA to the input.
3. Send a Write Enable command, $1WE, followed by a Minimum Value command, $1MN-00025.00. The response to both commands should be an *.
4. Apply +25mA to the input.
5. Send a $1WE command followed by a Maximum Value command, $1MX+00131.25. The response to both commands should be an *.

The entire range is rescaled and all values are read in percent.

SPECIFICATIONS

(Typical at +25°C and nominal power supply unless otherwise noted)

Analog
- Single channel analog input.
- Maximum CMV, input to output at 60Hz: 500V rms.
- Leakage current, input to output at 115Vrms, 60Hz: <2μA rms.
- 15-bit measurement resolution.
- 8 conversions per second.
- Autozero & autocalibration—no adjustment pots.

Digital
- 8-bit CMOS microcomputer.
- Digital scaling, linearization and calibration .
- Nonvolatile memory eliminates pots and switches.

Digital filtering
- Small and large signal with user selectable time constants from 0 to 16 seconds.

Events counter
- Up to 10 million positive transitions at 60Hz max., filtered for switch debounce.

Digital inputs
- Voltage levels: ±30V without damage.
- Switching levels: High, 3.5V min., Low, 1.0V max.
- Internal pull up resistors for direct switch input.

Digital outputs
- Open collector to 30V, 30mA max. load.

Alarm outputs
- HI/LO limit checking by comparing input values to down-loaded HI/LO limit values stored in memory.
- Alarms: latching (stays on if input returns to within limits or momentary (turns off if input returns to within limits.

Communications
- Communications in ASCII via RS-232C, RS-485 ports.
- Selectable baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.
- NRZ asynchronous data format; 1 start bit, 7 data bits, 1 parity bit and 1 stop bit.
- Parity: odd, even, none.
- User selectable channel address.
- ASCII format command/response protocol.
- Up to 124 multidrop modules per host serial port.
- Communications distance up to 10,000 feet (RS-485).
- Transient suppression on RS-485 communications lines.
- Communications error checking via checksum.
- Can be used with "dumb terminal".
- Scan up to 250 channels per second.
- All communications setups stored in EEPROM.

Power
- Requirements: Unregulated +10V to +30Vdc, 0.75W max (1500/2500, 2.0W max.).
- Internal switching regulator.
- Protected against power supply reversals.

Environmental
- Temperature Range: Operating –25°C to +70°C.
  Storage –25°C to +85°C.
- Relative Humidity: 0 to 95% noncondensing.

1100/2100 Voltage Input Modules
- Voltage ranges: ±10mV, ±1V, ±5V, ±10V, ±100Vdc.
- Resolution: 0.01% of FS (4 digits).
- Accuracy: ±0.02% of FS max.
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max.
- Input burnout protection to 250Vac .
- Input impedance: ≤ ±1V input = 100MΩ min.
  ≥ ±5V input = 1MΩ min.
- 1 Digital input/Event counter, 2 Digital outputs.

1200/2200 Current Input Modules
- Current ranges: ±1mA, ±10mA, ±100mA, ±1A, 4-20mAdc.
- Resolution: 0.01% of FS (4 digits), 0.04% of FS (4-20mA).
- Accuracy: ±0.02% of FS, 0.04% of FS (4-20mA).
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max. (±1A = ±80 ppm/°C max.)
- Voltage drop: ±0.1V max.
- 1 Digital input/Event counter, 2 Digital outputs.

1300 Thermocouple Input Modules
- Thermocouple types: J, K, T, E, R, S, B, C (factory set).
- Ranges: J = –200°C to +760°C B = 0°C to +1820°C
  K = –150°C to +1250°C S = 0°C to +1750°C
  T = –200°C to +400°C R = 0°C to +1750°C
  E = –100°C to +1000°C C = 0°C to +2315°C
- Resolution: ±1°.
- Overall Accuracy (error from all sources) from 0 to +40°C ambient:
  ±1.0 °C max (J, K, T, E).
  ±2.5 °C max (R, S, B, C)(300°C TO FS).
- Common mode rejection: 100dB at 50/60Hz.
- Input impedance: 100MΩ min.
- Lead resistance effect: <20μV per 350Ω.
- Open thermocouple indication.
- Input burnout protection to 250Vac.
- User selectable °C or °F.
- Overrange indication.
- Automatic cold junction compensation and linearization.
- 2 Digital inputs, Event counter, 3 Digital outputs.

1400 RTD Input Modules
- RTD types: a = .00385, .00392, 100Ω at 0°C,
  .00388, 100Ω at 25°C.
- Ranges: .00385 = –200°C to +850°C.
  .00392 = –200°C to +600°C.
  .00388 = –100°C to +125°C.
- Resolution: 0.1°.
- Accuracy: ±0.3°C.
- Common mode rejection: 100dB at 50/60Hz.
- Input connections: 2, 3, or 4 wire.
- Excitation current: 0.25mA.
- Lead resistance effect: 3 wire - 2.5°C per Ω of imbalance.
  4 wire - negligible.
- Max lead resistance: 50Ω.
- Input protection to 120Vac .
- Automatic linearization and lead compensation.
- User selectable °C or °F.
- 1 Digital output.

1450 Thermistor Input Modules
- Thermistor types: 2252Ω at 25°C, TD Series
- Ranges: 2252Ω = –0°C to +100°C.
  TD = –40°C to +150°C.
- Resolution: 2252Ω = 0.01°C or F.
  TD = 0.1°C or F
- Accuracy: 2252Ω = ±0.1°C.
  TD = ±0.2°C
- Common mode rejection: 100dB at 50/60Hz.
- Input protection to 30Vdc .
- User selectable °C or °F.
- 1 Digital input/ Event counter, 2 Digital outputs.

SPECIFICATIONS (CONT)

(Typical at +25°C and nominal power supply unless otherwise noted)

1500/2500 Bridge Input Modules

- Voltage Ranges: ±30mV, ±100mV, 1-6Vdc.
- Resolution: <10µV (mV spans). 0.02% of FS (V span).
- Accuracy: ±0.05% of FS max.
- Common mode rejection: 100dB at 50/60Hz.
- Offset Control: Full input range.
- Excitation Voltage: 5V, 8V, 10Vdc, 60mA max.
- Input burnout protection to 30V, any pin
- Zero drift: ±1µV/°C max.
- Span tempco: ±50ppm/°C max.
- 1 Digital output.

1600/2600 Timer and Frequency Input Modules

- Input impedance: 1MΩ.
- Switching level: Selectable 0V, +2.5V.
- Hysteresis: Adjustable 10mV-1.0V.
- Input protection: 250Vac .
- 1 Digital input/Event counter.

Frequency Input

- Range: 1Hz to 20KHz.
- Resolution: 0.005% of reading + 0.01Hz.
- Accuracy: ±0.01% of reading ±0.01Hz.
- Tempco: ±20ppm/°C.

Timer Input

- Range: 100µs to 30 s.
- Resolution: 0.005% of reading +10µs.
- Accuracy: ±0.01% of reading ±10µs.
- Tempco: ±20ppm/°C.

Event Counter Input

- Input Bandwidth: 60Hz, (optional 20KHz max.).
- Up to 10 million positive transitions.

Accumulator Input

- Input Frequency Range: 1Hz to 10KHz.
- Input Timer Range: 100µs to 30s.
- Pulse Count: Up to 10 million positive transitions.
- Resolution: 0.005% of reading +0.01Hz (frequency).
  0.005% of reading +10µs (timer) .
- Accuracy: ±0.01% of frequency reading ±0.01Hz.
  ±0.01% of timer reading ±10µs.
- Tempco: ±20ppm/°C.

1700 Digital Input/Output Modules

1711, 1712: 15 digital input/output bits.

- User can define any bit as an input or an output.
- Input voltage levels: 0-30V without damage.
- Input switching levels: High, 3.5V min., Low, 1.0V max.
- Outputs: Open collector to 30V, 100mA max. load.
- Vsat: 1.0V max @ 100mA.
- Single bit or parallel I/O addressing.

1701, 1702: 7 digital inputs and 8 digital outputs.

- Input voltage levels: ±30V without damage.
- Input switching levels: High, 3.5V min.,Low,1.0V max.
- Outputs: open collector to 30V, 30mA max. load.
- Vsat: 0.2V max at 30mA.
- Internal pull up resistors for direct switch input.
- Inputs/Outputs are read/set in parallel.

Specifications are subject to change without notice.

ORDERING INFORMATION

SCM9B-1000/2000 SENSOR-TO-COMPUTER PRODUCTS

("2000" SERIES PRODUCTS HAVE USER-PROGRAMMABLE FEATURES)

MODEL	INPUT RANGE/OUTPUT
VOLTAGE INPUT	
SCM9B-1101/2101	±10mV Input/RS-232C Output
SCM9B-1102/2102	±10mV Input/RS-485 Output
SCM9B-1111/2111	±100mV Input/RS-232C Output
SCM9B-1112/2112	±100mV Input/RS-485 Output
SCM9B-1121/2121	±1V Input/RS-232C Output
SCM9B-1122/2122	±1V Input/RS-485 Output
SCM9B-1131/2131	±5V Input/RS-232C Output
SCM9B-1132/2132	±5V Input/RS-485 Output
SCM9B-1141/2141	±10V Input/RS-232C Output
SCM9B-1142/2142	±10V Input/RS-485 Output
SCM9B-1151/2151	±100V Input/RS-232C Output
SCM9B-1152/2152	±100V Input/RS-485 Output
CURRENT INPUTS	
SCM9B-1211/2211	±10mA Input/RS-232C Output
SCM9B-1212/2212	±10mA Input/RS-485 Output
SCM9B-1221/2221	±1mA Input/RS-232C Output
SCM9B-1222/2222	±1mA Input/RS-485 Output
SCM9B-1231/2231	±100mA Input/RS-232C Output
SCM9B-1232/2232	±100mA Input/RS-485 Output
SCM9B-1241/2241	±1A Input/RS-232C Output
SCM9B-1242/2242	±1A Input/RS-485 Output
SCM9B-1251/2251	4-20mA Input/RS-232C Output
SCM9B-1252/2252	4-20mA Input/RS-485 Output
THERMOCOUPLE INPUTS	
SCM9B-1311	J Thermocouple Input/RS-232C Output
SCM9B-1312	J Thermocouple Input/RS-485 Output
SCM9B-1321	K Thermocouple Input/RS-232C Output
SCM9B-1322	K Thermocouple Input/RS-485 Output
SCM9B-1331	T Thermocouple Input/RS-232C Output
SCM9B-1332	T Thermocouple Input/RS-485 Output
SCM9B-1341	E Thermocouple Input/RS-232C Output
SCM9B-1342	E Thermocouple Input/RS-485 Output
SCM9B-1351	R Thermocouple Input/RS-232C Output
SCM9B-1352	R Thermocouple Input/RS-485 Output
SCM9B-1361	S Thermocouple Input/RS-232C Output
SCM9B-1362	S Thermocouple Input/RS-485 Output
SCM9B-1371	B Thermocouple Input/RS-232C Output
SCM9B-1372	B Thermocouple Input/RS-485 Output
SCM9B-1381	C Thermocouple Input/RS-232C Output
SCM9B-1382	C Thermocouple Input/RS-485 Output

MODEL	INPUT RANGE/OUTPUT
RTD INPUTS	
SCM9B-1411	.00385 RTD Input/RS-232C Output
SCM9B-1412	.00385 RTD Input/RS-485 Output
SCM9B-1421	.00392 RTD Input/RS-232C Output
SCM9B-1422	.00392 RTD Input/RS-485 Output
SCM9B-1431	.00388 RTD Input/RS-232C Output
SCM9B-1432	.00388 RTD Input/RS-485 Output
SCM9B-1451	2252Ω Thermistor Input/RS-232C Output
SCM9B-1452	2252Ω Thermistor Input/RS-485 Output
SCM9B-1461	TD Thermistor Input/RS-232C Output
SCM9B-1462	TD Thermistor Input/RS-485 Output
BRIDGE INPUTS	
SCM9B-1511/2511	±30mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1512/2512	±30mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1521/2521	±30mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1522/2522	±30mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1531/2531	±100mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1532/2532	±100mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1541/2541	±100mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1542/2542	±100mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1551/2551	1-6V Bridge Input, 8V Excitation/RS-232C Output
SCM9B-1552/2552	1-6V Bridge Input, 8V Excitation/RS-485 Output
SCM9B-1561/2561	1-6V Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1562/2562	1-6V Bridge Input, 10V Excitation/RS-485 Output
TIMER AND FREQUENCY INPUTS	
SCM9B-1601/2601	Frequency Input/RS-232C Output
SCM9B-1602/2602	Frequency Input/RS-485 Output
SCM9B-1611/2611	Timer Input/RS-232C Output
SCM9B-1612/2612	Timer Input/RS-485 Output
SCM9B-1621	Event Counter/RS-232C Output
SCM9B-1622	Event Counter/RS-485 Output
SCM9B-1631/2631	Accumulator, Frequency Input/RS-232C Output
SCM9B-1632/2632	Accumulator, Frequency Input/RS-485 Output
SCM9B-1641/2641	Accumulator, Timer Input/RS-232C Output
SCM9B-1642/2642	Accumulator, Timer Input/RS-485 Output
DIGITAL INPUTS/OUTPUTS	
SCM9B-1701	7 Digital Inputs, 8 Digital Outputs/RS-232C Output
SCM9B-1702	7 Digital Inputs, 8 Digital Outputs/RS-485 Output
SCM9B-1711	15 Digital Inputs and/or Outputs/RS-232C Output
SCM9B-1712	15 Digital Inputs and/or Outputs/RS-485 Output

SCM9B-3000/4000 Series
Computer-to-Analog Output Modules

FEATURES

- ANALOG OUTPUT RANGES: 0-1V, ±1V, 0-5V, ±5V, 0-10V, ±10V, 0-20mA, 4-20mA.
- COMMUNICATES IN ASCII WITH RS-232 OR RS-485 SERIAL PORTS.
- PROGRAMMABLE HIGH/LOW OUTPUT LIMITS.
- 500Vrms OUTPUT ISOLATION.
- 12-BIT OUTPUT RESOLUTION.
- SCALING IN ENGINEERING UNITS.
- BAUD RATES: 300 TO 38,400.
- NONVOLATILE DIGITAL CALIBRATION.
- OUTPUT PROTECTION: 240VAC (CURRENT OUTPUT). ±30V (VOLTAGE OUTPUTS).
- DIRECT CONNECTION TO 'DUMB' TERMINALS OR MODEMS.
- REQUIRES +10 to +30Vdc UNREGULATED SUPPLY.
- MAY BE LOCATED UP TO 10,000 FEET FROM HOST (RS-485).
- ADDRESSABLE: UP TO 124 UNITS PER SERIAL PORT.
- ' BUMPLESS' MANUAL CONTROL INPUTS.

PROGRAMMABLE FEATURES (4000 SERIES)

(Provides intelligent features not found in the 3000 Series.)

- Fully Programmable Output Slopes: 0.01V/s (mA/s) to 10,000V/s (mA/s).
- Programmable Data Scaling to any Desired Units.
- True Analog Readback of Output Signal.
- Programmable Starting Value.
- Programmable Watchdog Timer Provides Orderly Shutdown in the Event of Host Failure.

DESCRIPTION

The SCM9B-3000/4000 series are complete computer-to-analog output interfaces. They are designed to be mounted remotely from a host computer and communicate, in ASCII, with standard RS-232 and RS-485 serial ports. Simple ASCII commands are used to control a 12-bit DAC (Digital-to-Analog Converter) which is scaled to provide commonly used current and voltage ranges. An 8-bit CMOS microprocessor provides an intelligent interface between the host and the DAC. The 3000/4000 are compatible with the 1000/2000 input modules and may be mixed in any order.

The modules are easy to use. You do not need engineering experience in complicated data acquisition hardware. This modular approach to data acquisition is extremely flexible, easy to use and cost effective. The modules can be mixed and matched to fit the application. They can be placed remote from the host and from each other. You can string up to 124 modules on one set of wires.

Although software is not required, utility software (SCM9B-S1000) is available on IBM-compatible diskette to make the 3000/4000 easier to learn and use. S1000 software is provided at no charge on request with a purchase order and is not copy protected.

THEORY OF OPERATION

Figure 1 shows a functional block diagram of the 3000/4000. The DAC converts digital data derived from host commands into the desired analog output. The microprocessor receives commands and data from the host computer through an RS-232 or RS-485 port. A wide variety of two-or-three-letter commands from the host control the DAC, read status information, and configure the module to fit your requirements. Responses to commands are produced by the microprocessor and transmitted back to the host over the serial link.

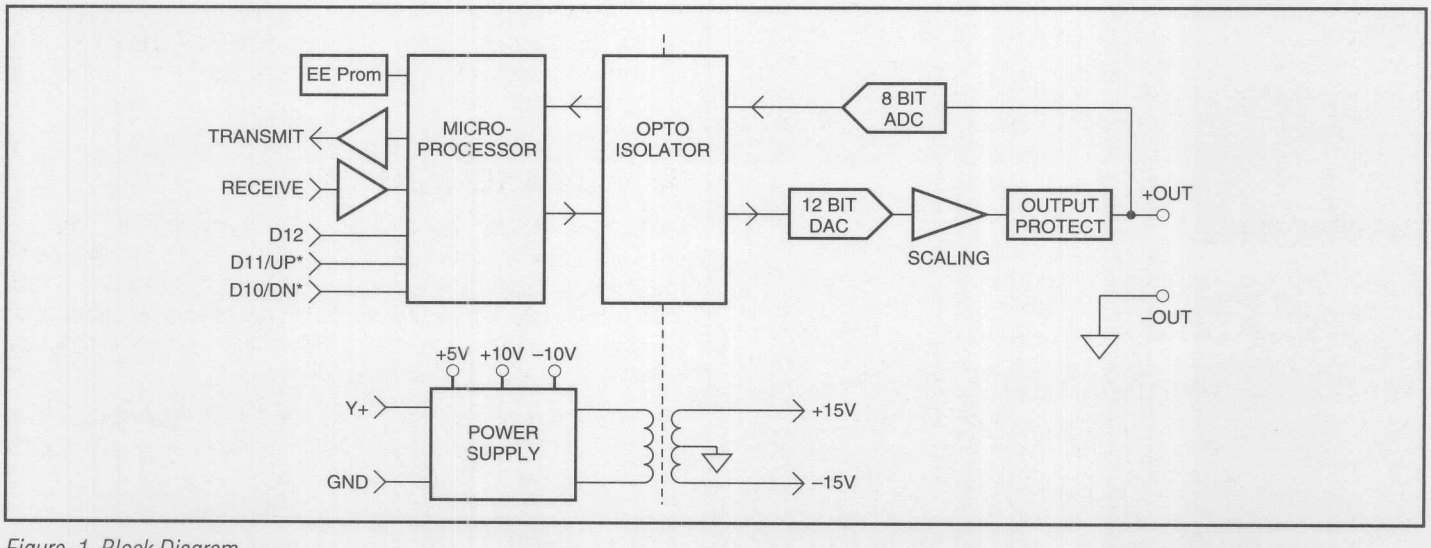


Figure 1. Block Diagram.

For example, the module's analog output is controlled by the Analog Output (AO) command from the host. The host command/module response sequence looks like this:

Command: $1AO+00010.00
Response: *

If a 0-20mA output module is used for this example, the AO command produces a 10mA output. The module performs the output function and responds with a '*' as an acknowledgment that the command has been performed.

In response to host commands, the microprocessor produces the appropriate digital data necessary to control the DAC. Digital data is transmitted to the DAC through opto-isolators that provide electrical isolation. The DAC produces a precise analog current that is directly proportional to the magnitude of the digital data. The DAC output current is processed and amplified by signal conditioning circuits to produce the desired output voltage or current. Output protection circuits protect the module from potentially damaging output faults.

An EEPROM (Electrically Erasable Programmable Read-Only Memory) retains important data such as the address, baud rate, parity and calibration data even if the module is powered down.

The 4000 series features an 8-bit ADC (Analog to Digital Converter) that monitors the output signal. The ADC input is tied to the analog output and converts the signal level to digital data. The digital data is optically isolated and may be read by the microprocessor. The ADC allows the user to monitor the output signal and ensure its integrity.

The power supply converts the raw 10 to 30V input power into regulated voltages used to operate the module. The power it supplies to the DAC and output circuits is transformer isolated from the input power and communications connections. The transformer and opto-isolators provide an isolation barrier between the output section and the rest of the circuitry. The isolation barrier is helpful in breaking ground loops, isolating troublesome common-mode voltages and protects the host and module in cases where the output may accidentally contact AC power lines.

The combination of an accurate high-resolution DAC and a dedicated microprocessor produces a very powerful system for generating process control signals. The microprocessor provides software addressing for multidrop capability, data formatting in engineering units, limit checking, digital calibration and many other features not possible with unintelligent analog output systems.

All modules are supplied with screw terminal plug connectors and captive mounting hardware. The connectors allow system expansion, reconfiguration or repair without disturbing field wiring. Their small size allows them to be mounted in virtually any location or position including DIN rails and explosion-proof housings.

MANUAL MODE

Manual Up/Down control option provides a local operator interface to control the analog output value independent of the host. As shown in Figure 2, the analog output may be moved up or down by shorting the UP* or DN* inputs to the GND terminal. Grounding both pins at once holds the output at its present value and inhibits any output commands from the communications ports. The control inputs may also be logic signals from other equipment. The manual mode controls the output with a linear slope. The slope rate on 3000 modules is fixed and scaled so that a full-scale output change takes 5 seconds.

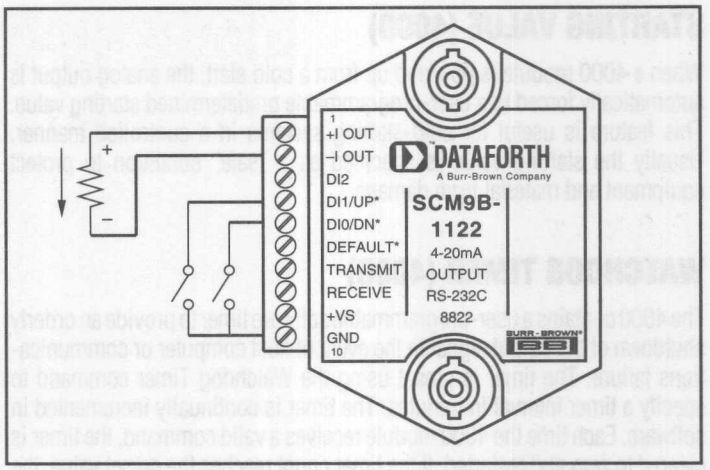


Figure 2. Manual Up/Down Control.

SLOPE CONTROL (4000)

Most DACs provide a step function when a new output value is desired. That is, the analog output change is instantaneous subject only to DAC settling time. In many applications this characteristic is undesirable and a gradual controlled output slew rate is more appropriate. In applications where controlled output rates are needed, precious host computer time must be used to continually monitor and step the DAC until the desired output is reached.

The 4000 allows controlled output slopes automatically without host computer intervention. User-programmable output slew rates are stored in nonvolatile memory. If a command is sent to the 4000 to change the output value, the output will automatically slope to the new value at the specified rate. The nonvolatile slope value is restored each time the module is powered up.

The 4000 microprocessor controls the output slew rate by updating the DAC at a rate of 1000 conversions per second at precise 1ms intervals. In this manner the DAC is smoothly stepped until the final output value is reached. The DAC's incremental output steps and its conversion rate combine to make the output change appear to be a linear ramp.

MANUAL SLOPE CONTROL (4000)

The 4000 allows the user to specify the output slope when the output is controlled by the manual UP/DOWN inputs. The manual slope data is stored in EEPROM. The manual slope is independent of the slopes used with the computer controlled output. The manual rate may be changed with the Manual Slope command.

INPUT DATA SCALING (4000)

All 3000 and 4000 modules are factory set with data values in millivolts or milliamps. The 4000 allows the user to scale the input data to any desired units. In many applications a change in input scaling makes the data easier to read and interpret. For example, a 4000 used to control a valve actuator may be easier to use if the data is scaled with a range of 0-100% rather than 4-20mA.

The input scaling may be changed by using the Maximum and Minimum commands to assign input data values corresponding to the module's maximum and minimum output values.

STARTING VALUE (4000)

When a 4000 module is powered up from a cold start, the analog output is automatically forced to a user-programmable predetermined starting value. This feature is useful for cold-starting systems in a controlled manner. Usually the starting value is specified as a "safe" condition to protect equipment and material from damage.

WATCHDOG TIMER (4000)

The 4000 contains a user-programmable software timer to provide an orderly shutdown of the output signal in the event of host computer or communications failure. The timer is preset using the Watchdog Timer command to specify a timer interval in minutes. The timer is continually incremented in software. Each time the 4000 module receives a valid command, the timer is cleared to zero and restarted. If the timer count reaches the preset value, the output will automatically be forced to slew to the starting value using the present output slope rate. The starting value should be programmed to provide a "safe" output value to minimize damage and disruption to the system under control.

ANALOG READBACK (4000)

The Read Data command in the 3000/4000 series provides a status report of the output of a module. However, the data obtained with this command only indicates the digital data that is being transferred from the onboard microprocessor to the DAC. It does not indicate whether the DAC output is correct. It cannot detect fault conditions such as shorts or open circuits.

The 4000 series contains an ADC that provides true readback of the analog output signal. The ADC is independent of the DAC. The ADC provides true analog readback data to the microprocessor. While not intended to be a highly accurate measurement of the output signal, the ADC greatly enhances the user's confidence that the analog output is being produced as intended. Output fault conditions from improper wiring or loads can be easily detected. The ADC also provides a form of redundancy to ensure that the module is working properly.

COMMAND SET

The 3000/4000 series use a simple command/response protocol for communication. A module must be interrogated by the host to obtain data. A module can never initiate a command sequence. A typical command/response sequence could look like this:

Command: $1RD
Response: *+00075.00

A command is initiated with a command prompt, which may be a dollar sign ($) or a pound sign (#). Following the prompt a single address character must be transmitted. Each module on a communications bus must be setup with a unique address. In this case, the command is directed to module address '1'. The address is followed by a two-or-three-character command which in this case is RD for Read Data. The command is terminated with a carriage return.

After module address '1' receives the command it will respond with the analog output data. The response begins with a response prompt, which is an asterisk (*). The data is read back in a standardized format of sign, 5 digits, decimal point, and 2 more digits. All 3000/4000 modules represent data in the same standard format.

Table 1 shows all of the 3000/4000 commands. For each case, a sample command and response is shown. Note that some commands only respond with an * as an acknowledgment. For clarity, Table 1 separates 4000 commands from the commands that are common to both the 3000 and 4000. Table 1 also separates write protected commands from commands that are not write protected.

For greater data security, options are available to echo transmitted commands and to send and receive check-sums. The # command prompt requests a response message from the module that begins with an *, followed by the channel address, command, data (if necessary) and checksum. This response echoes the channel address and command for verification and adds checksum for error checking. Checksum is a two character hexadecimal value that can be added to the end of any command message, regardless of prompt, at your option. Checksum verifies that the message received is exactly the same as the message sent.

The 3000/4000 performs extensive error checking on commands and responds with an error message if necessary. All error messages start with an error prompt (?) followed by the channel address and the error description. In the following example, the 3000/4000 does not recognize 'AB' as a valid command.

Command: $1AB
Response: ?1 COMMAND ERROR

Table 1: 3000/4000 Series Command Set

Command	Definition	Typical Command Message	Typical Response Message
3000/4000 Commands			
ACK	Acknowledge	$1ACK	*
AO	Analog Output	$1AO+00020.00	*
DI	Digital Input	$1DI	*0007
HX	Hex Output	$1HX0FFF	*
RAO	Read Analog Output	$1RAO	*+00017.50
RD	Read Data	$1RD	*+00012.34
RHI	Read High Limit	$1RHI	*+00020.00
RID	Read Identification	$1RID	*BOILER
RLO	Read Low Limit	$1RLO	*+00000.00
RMS	Read Manual Slope	$1RMS	*+00004.00
RMX	Read Maximum	$1RMX	*+00020.00
RMN	Read Minimum	$1RMN	*+00000.00
RS	Read Setup	$1RS	*31070140
RSU	Read Setup	$1RSU	*31070140
WE	Write Enable	$1WE	*
The following 3000/4000 commands are Write Protected			
HI	High Limit	$1HI+00015.00	*
ID	Identification	$1IDBOILER	*
LO	Low Limit	$1LO+00004.00	*
RR	Remote Reset	$1RR	*
SU	Setup	$1SU310701C0	*
TMX	Trim Maximum	$1TMX+00020.17	*
TMN	Trim Minimum	$1TMN+00000.95	*
4000 Commands Only			
RAD	Read Analog Data	$1RAD	*+00012.34
RPS	Read Present Slope	$1RPS	*+00001.00
RSL	Read Slope	$1RSL	*+00001.00
RSV	Read Starting Value	$1RSV	*+00005.00
RWT	Read Watchdog Timer	$1RWT	*+00010.00
The following 4000 Only commands are Write Protected			
MS	Manual Slope	$1MS+00001.00	*
MX	Maximum	$1MX+00100.00	*
MN	Minimum	$1MN-00025.00	*
SL	Slope	$1SL+00001.00	*
SV	Starting Value	$1SV+00004.00	*
TRX	Trim Readback Maximum	$1TRX	*
TRN	Trim Readback Minimum	$1TRN	*
WT	Watchdog Timer	$1WT+00010.00	*
WSL	Write Slope To EEPROM	$1WSL+00100.00	*

APPLICATIONS

Scaling data in RPM

A 4000 voltage output module is used to supply the control signal to a motor speed controller. The full scale range of the 4000 is 0 to +10V. When this voltage is applied to the motor, speed varies from 100 to 3000 RPM. To command the motor to turn at a specified RPM requires some computation to obtain the correct command data.

For instance, to command the motor to go at 1500 RPM requires an output voltage of 4.666V. This data is difficult to read and interpret. A solution to this problem is to scale the input data directly in units of RPM.

The –full scale output of 0V is assigned the value 100 RPM with the MN command. The + full scale output of +10V is assigned the value of 3000 RPM with the MX command. Once the endpoint values are assigned, all other data values are interpolated linearly. Now to set the motor to 1500 RPM requires the analog output command:

$1AO+01500.00

The data is much easier to interpret since the scaling is in RPM. The actual output voltage is +4.666V.

Scaling data in %

A valve actuator accepts a 4-20mA signal: at 4mA the valve is fully closed and at 20mA the valve is fully open. We wish to rescale a 4252 0-20mA module to accept data of 0% closed to 100% open.

The Minimum (MN) command assigns an input data value of 0mA to the - full scale output of the module.

Using the two scaling points (4mA = 0%) and (20mA = 100%) and a bit of computation, we find that 0mA interpolates to a value of –25%. This value is used in the argument of the MN command:

$1MN-00025.00

The maximum scaling point of 20mA is assigned the input value of 100%:

$1MX+00100.00

The module is now scaled in percentage of valve opening. To set the valve to 50% opening:

$1AO+00050.00

In this case the 4000 module produces an output of 12mA, opening the valve halfway.

SPECIFICATIONS (Typical at +25°C and nominal power supply unless otherwise noted).

Analog Output
- Single channel analog output.
  Voltage: 0-1V, ±1V, 0-5V, ±5V, 0-10V, ±10V.
  Maximum output current: 5mA
  Current: 0-20mA, 4-20mA.
  Compliance Voltage: 12V
- Output isolation: 500V rms.
- 12-bit output resolution.
- Accuracy (Integral & Differential Nonlinearity): 0.1% FSR (max).
- Zero drift: ±30µV/°C (Voltage Output max).
  ±0.2µA/°C (Current Output max).
- Span tempco: ±25ppm/°C max.
- 1000 conversions per second.
- Settling time to 0.1% FS: 300µs typ (1ms max).
- Output change manual mode (–FS to +FS): 5s.
- Programmable output slope (4000): 0.01V/s (mA/s) to 10,000V/s (mA/s).
- Current output voltage compliance: 12V.
- Voltage Output drive: 5mA min, 10mA max.

Analog Output Readback (4000)
- 8-bit analog to digital converter.
- Accuracy over temperature (–25 to +70°C): 2.0% FS max.

Digital
- 8-bit CMOS microcomputer.
- Digital scaling and calibration stored in nonvolatile memory.
- Programmable High/Low output limits.
- Programmable data scaling (4000).
- Programmable starting value (4000).
- Programmable watchdog timer provides orderly shutdown in the event of host failure (4000).

Digital Inputs
- Three digital inputs per module.
- Voltage levels: ±30V without damage.
- Switching levels: High, 3.5V min., Low, 1.0V max.
- Internal pull up resistors for direct switch input.

Communications
- Communications in ASCII via RS-232C, RS-485 ports.
- Selectable baud rates: 300, 600, 1200, 2400, 4800, 9600,19200, 38400.
- NRZ asynchronous data format; 1 start bit, 7 data bits, 1 parity bit and 1 stop bit.
- Parity: odd, even, none.
- User selectable channel address.
- ASCII format command/response protocol.
- Up to 124 multidrop modules/host communications port.
- Communications distance up to 10,000 feet (RS-485).
- Can be used with "dumb" terminal.
- All communications setups (address, baud rate, parity) stored in nonvolatile memory using EEPROM.
- Checksum can be added to any command or response.

Power
- Requirements: Unregulated +10V to +30Vdc, 0.75W max. (Voltage Output), 1.0W max. (Current Output).
- Internal switching regulator.
- Protected against power supply reversals.

Mechanical
- Dimensions: See dimension drawing.
- Case: ABS with captive mounting hardware.
- Connectors: Screw terminal barrier plug (supplied). Replace with Phoenix MSTB 1.5/10 ST 5.08 or equivalent.

Environmental
- Temperature Range: Operating –25°C to +70°C.
  Storage –25°C to +85°C.
- Relative Humidity: 0 to 95% noncondensing.

Specifications are subject to change without notice.

ORDERING INFORMATION

SCM9B-3000/4000 COMPUTER-TO-ANALOG OUTPUT PRODUCTS

("4000" SERIES PRODUCTS HAVE USER-PROGRAMMABLE FEATURES)

MODEL	OUTPUT RANGE/INPUT
VOLTAGE OUTPUT	
SCM9B-3121/4121	±1V Output/RS-232C Input
SCM9B-3122/4122	±1V Output/RS-485 Input
SCM9B-3131/4131	±5V Output/RS-232C Input
SCM9B-3132/4132	±5V Output/RS-485 Input
SCM9B-3141/4141	±10V Output/RS-232C Input
SCM9B-3142/4142	±10V Output/RS-485 Input
SCM9B-3161/4161	0 to 1V Output/RS-232C Input
SCM9B-3162/4162	0 to 1V Output/RS-485 Input
SCM9B-3171/4171	0 to 5V Output/RS-232C Input
SCM9B-3172/4172	0 to 5V Output/RS-485 Input
SCM9B-3181/4181	0 to 10V Output/RS-232C Input
SCM9B-3182/4182	0 to 10V Output/RS-485 Input
CURRENT OUTPUT	
SCM9B-3251/4251	0 to 20mA Output/RS-232C Input
SCM9B-3252/4252	0 to 20mA Output/RS-485 Input
SCM9B-3261/4261	4 to 20mA Output/RS-232C Input
SCM9B-3262/4262	4 to 20mA Output/RS-485 Input

COMMUNICATIONS

The 1000/2000/3000/4000 series modules are designed to be easy to interface to all popular computers and terminals. All communications to and from the module are performed with printable ASCII characters. This allows the information to be processed with string functions common to most high-level languages such as BASIC. For computers that support standard ports such as RS-232C, no special machine language software drivers are necessary for operation. The modules can also be connected to auto-answer modems for long-distance operation without the need for a remote supervisory computer. The ASCII format makes system debugging easy with a dumb terminal.

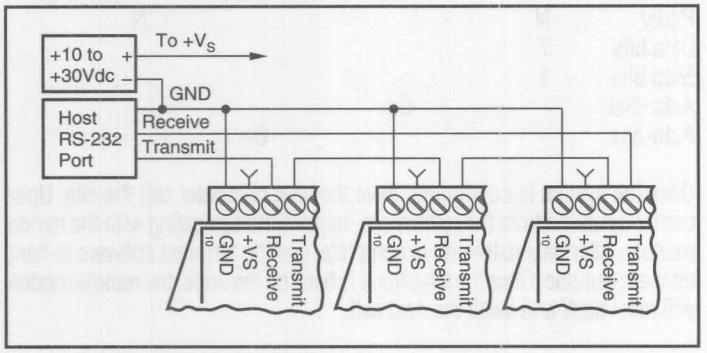


Figure 1. RS-232 Daisy Chain Network.

RS-232C is the most widely used communications standard for information transfer between computing equipment. RS-232C versions of the modules will interface to virtually any computer without additional hardware. RS-232C is not designed to be used as a multiparty system; however the modules can be daisy-chained, as shown in Figure 1, to allow many modules to be connected to a single communications port. In this network, any characters transmitted by the host are received by each module in the chain and passed on to the next station until the information is echoed back to the host. In this way all commands given by the host are examined by every module in the chain. If a module is correctly addressed and receives a valid command, it transmits a response on the daisy-chain network. The response will be rippled through any other modules in the chain until it reaches the host.

RS-485 is a communications standard developed for multidropped systems that can communicate at high data rates over long distances, as shown in Figure 2. RS-485 is similar to RS-422 in that it uses a balanced differential pair of wires switching from 0 to 5V to communicate data. RS-485 receivers can handle common mode voltages from –7 to +12V without loss of data, making them ideal for transmission over great distances. RS-485 differs from RS-422 by using one balanced pair of wires for both transmitting and receiving. Since an RS-485 system cannot transmit and receive at the same time it is a half-duplex system. For systems that require many modules, long wiring distances, or high speed, we recommend the RS-485 standard.

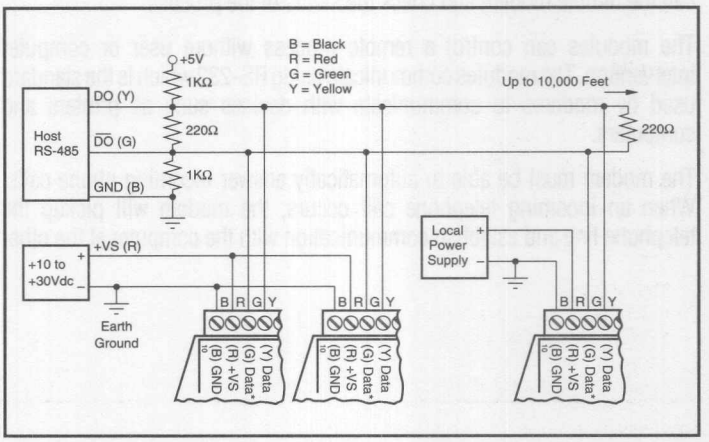


Figure 2. RS-485 Multidrop Network.

100 CHANNEL NETWORK

Figure 3 shows 100 SCM9B modules being controlled by a personal computer and SCM9B-A1000 converters/repeaters. RS-485 is the obvious choice for high channel count networks because of its multidrop capability.

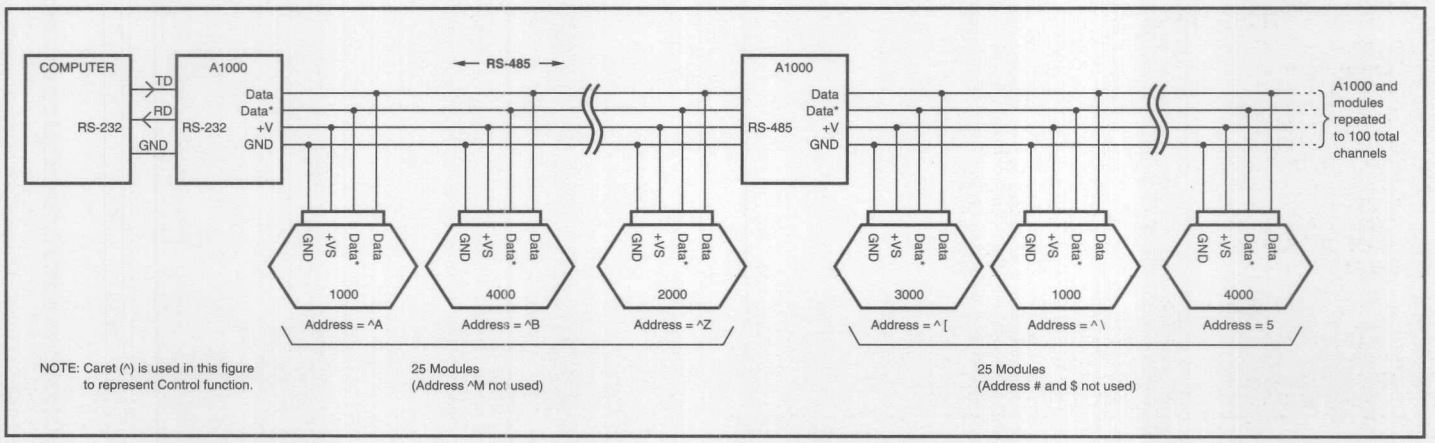


Figure 3. 100 Channel Network.

SCM9B

Call 800-444-7644
For Information and Assistance
DATAFORTH
A Burr-Brown Company

RS-485 is inherently half-duplex so it cannot transmit and receive at the same time. Each module contains its own unique channel address that you specify. Only the channel requested will respond to your command. The modules work on a command/response protocol so they can never initiate a transmission sequence. Therefore, errors due to bus contention are eliminated.

Since very few computers or terminals have built-in support for RS-485, a RS-232C/RS-485 Converter is required. RS-485 handles only 32 drivers on each communications port. The RS-485 Repeater reshapes and amplifies the RS-485 signal to handle as many as 32 more drivers allowing you to extend the RS-485 network by adding a repeater every 32 channels. These converters also provide a power supply output of +24V at 1A to power the modules. The supply protects against overloads and short circuits. To protect the host computer, the host input connection is optically isolated to 1500Vac, and the RS-485 output connections are tied to ground to provide a safe path for static discharge.

Using modems and SCM9B modules

The modules can also be used with auto-answer modems for long-distance operation without the need for a supervisory computer. Both the module and modem can be placed at a remote site. A personal computer may be used to call the remote modem and check the status of the process.

The modules can control a remote process without user or computer intervention. The modules communicate using RS-232 which is the standard used by modems to communicate with devices such as printers and computers.

The modem must be able to automatically answer incoming phone calls. When an incoming telephone call occurs, the modem will pickup the telephone line and establish communication with the computer at the other end. The other modem function required is the Ignore RS-232C DTR line. The modules do not support the Data Transmit Ready line so the modem must ignore it. Since DTR is ignored, the modem and module are always ready for incoming calls. Other modem control functions such as: enable auto redial on busy, "beep" on power up, enable command mode, etc. are not applicable and may be set to their default settings.

The computer must have either an internal modem or ability to connect to an external modem. If an external modem is used the computer must have a serial RS-232C communications port. Terminal software, or equivalent, is also required to control the modem and communicate with the remote module.

Before dialing the site, input the correct communications parameters to the terminal software program. All communications parameters needed to establish communication with the remote module are shown in the following table.

	Terminal software	Computer modem	Remote modem	SCM9B module
Baud rate	1200	1200	1200	1200
Parity	N			N
Data bits	7			
Stop bits	1			
Auto-dial		On		
Auto-ans.			On	

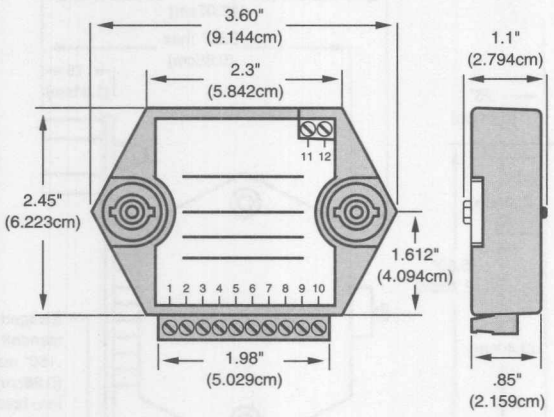
Once the system is configured, have the host computer call the site. Upon carrier detection from the remote site, begin communicating with the remote module. After data gathering is complete, use the terminal software to hang up the telephone. Once the telephone is back on the hook, the remote modem will reset itself and await the next call.

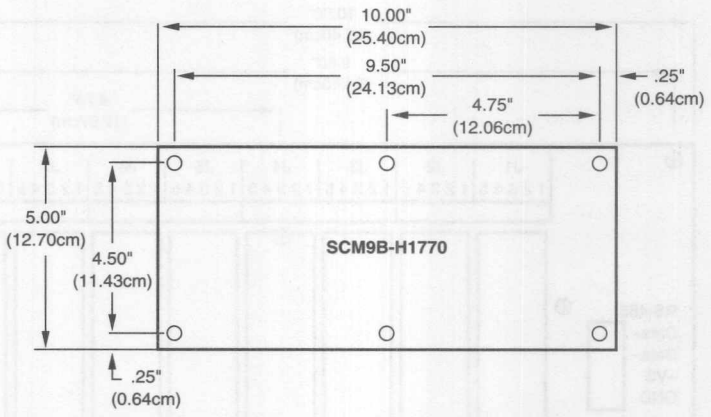
SCM9B Series
Mechanical Dimensions

Mechanicals and Dimensions-SCM9B-1000/200/3000/4000

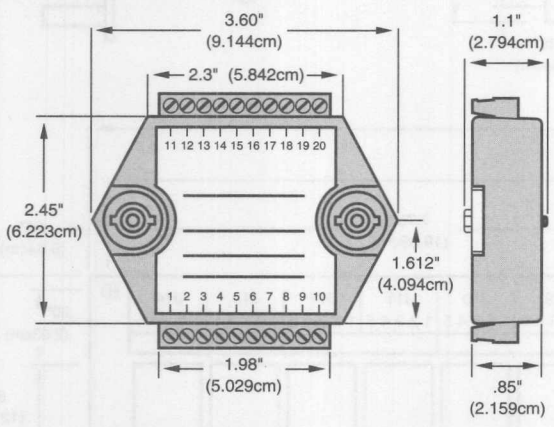
Case: ABS with captive mounting hardware.
Connectors: Screw terminal barrier plug (supplied).
Replace with Phoenix MSTB 1.5/10 ST 5.08 or equivalent.

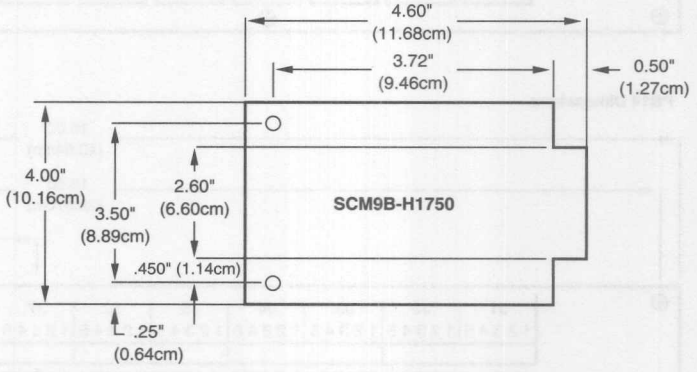
1300 Series



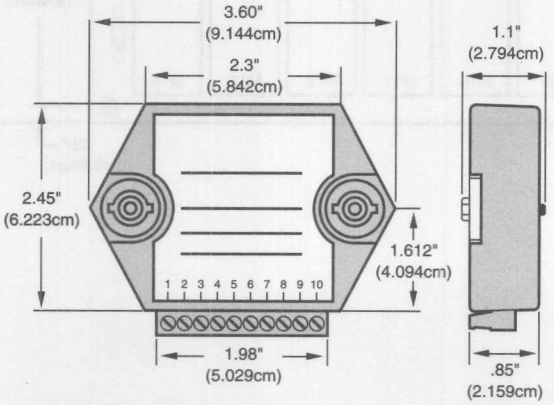


1700 Series





1000/2000/3000/4000 Series



NOTE: Spacing for mounting screws
= 2.700" (6.858 cm). Screw threads are 6 X 32.

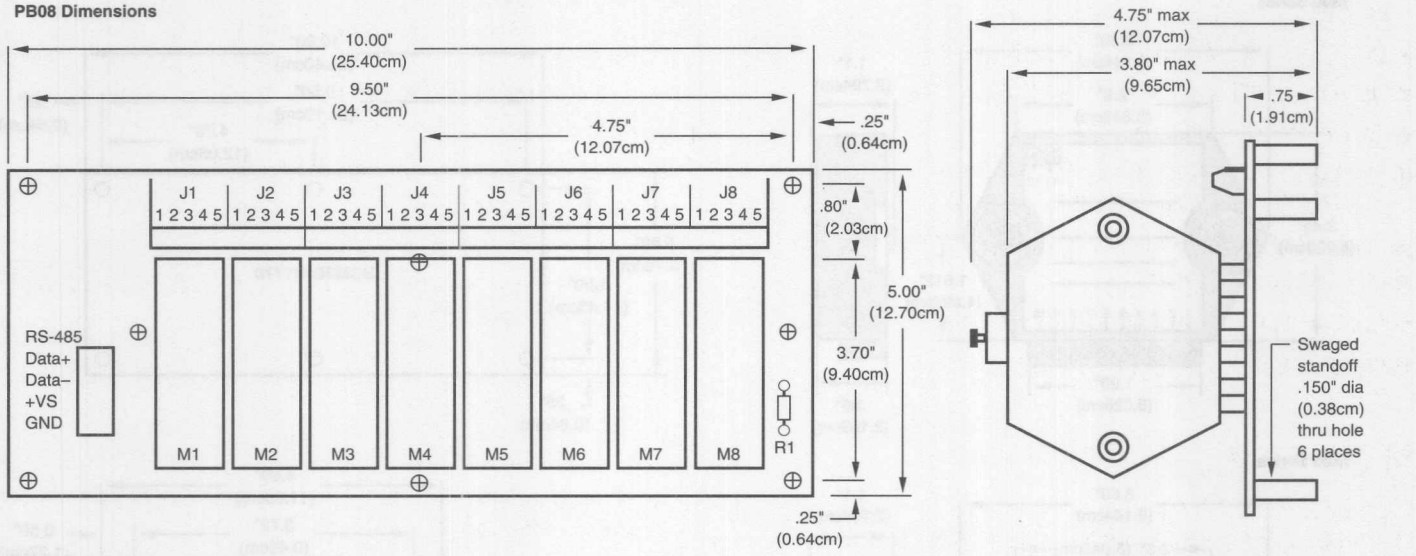
SCM9B

8 AND 14 CHANNEL MOUNTING BACKPLANES

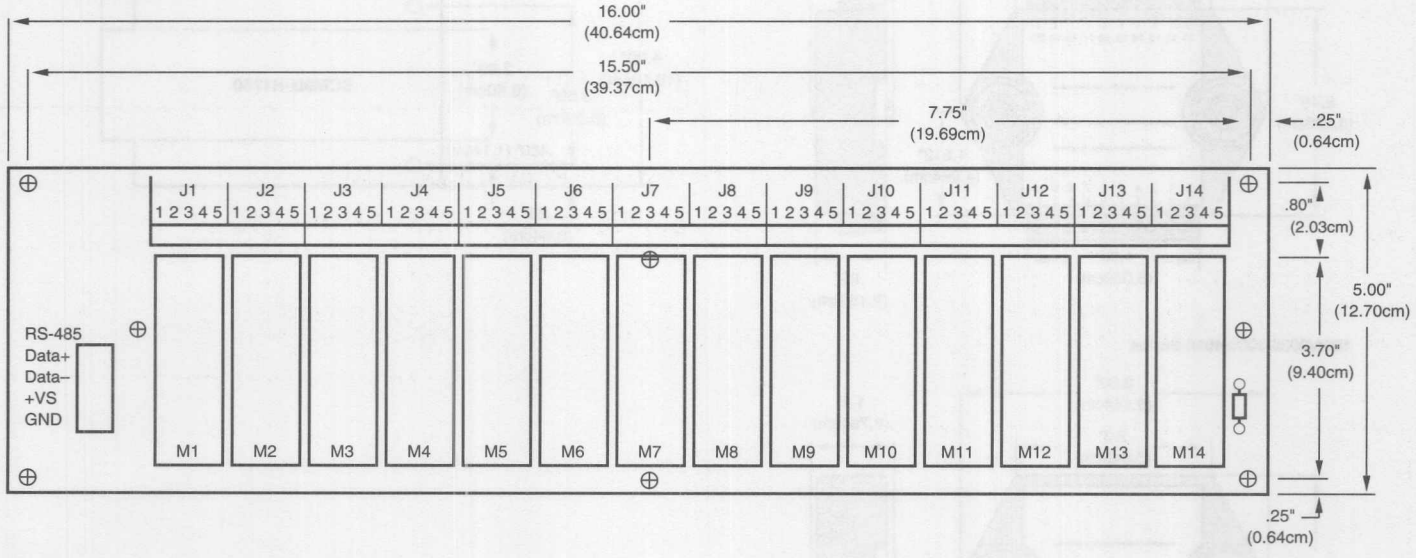
The SCM9B-PB08 and PB14 are 8 and 14 channel mounting backplanes. The backplanes accept any RS-485 analog input or analog output modules and are designed to be mounted in standard 19 inch racks. RS-485 modules are used because RS-485 is the preferred communications standard for high channel count applications. Although analog modules are used it must be noted that every module has some digital I/O capability. Therefore the combination of modules with the backplanes make a cost effective, high density remote analog and digital data acquisition system.

The backplanes reduce wiring costs by providing all common connections on the backplane. Each backplane includes screw terminals for all inputs, outputs, power connections and communications signals. The backplanes also include swaged thru-hole standoffs for mounting, a hold-down bar, and holes for an RS-485 termination resistor.

PB08 Dimensions



PB14 Dimensions



SCM9B-H1750/H1770 24 & 64 Channel Digital I/O Boards

FEATURES

- COMPUTER MONITORING AND CONTROL OF STANDARD DIGITAL I/O MODULES VIA RS-232 OR RS-485
- DIGITAL INPUTS AND OUTPUTS INTERFACE WITH SOLID STATE RELAYS TO SENSE AC AND DC VOLTAGES
- CONTROLS DIGITAL INPUTS AND OUTPUTS INDIVIDUALLY
- USER CAN DEFINE ANY BIT AS INPUT OR OUTPUT
- 24, 64 CHANNEL VERSIONS
- EXPANDS UP TO 7936 DIGITAL I/O CHANNELS (124 MULTIDROPPED 64-CHANNEL BOARDS)
- READ OR SET 7936 INPUTS OR OUTPUTS IN LESS THAN 1s
- MOUNTS IN 19" RACKS
- COMPATIBLE WITH ALL SCM9B PRODUCTS
- SAME COMMAND SET AS 1700 SERIES MODULES

DESCRIPTION

The SCM9B-H1750/H1770 digital I/O interface is designed to expand the remote I/O capability of the SCM9B-1700 series of modules. Commands are communicated over RS-232 or RS-485 links from any standard serial I/O port of computers or modems. The command set for the H1700 series boards is identical to the 1700 series modules (see Figure 1).

The H1750 is designed to interface directly to either a 16 or 24 channel industry-standard solid-state relay rack (Dataforth part numbers SCMD-PB16 or SCMD-PB24). The H1770 will connect to a maximum of four 16-channel racks (SCMD-PB16). As with the SCM9B modules, up to 124 boards can be multidropped using RS-485 communications and SCM9B-A1000 repeaters.

The I/O channels may be configured to be inputs or outputs in any combination designated by the user. The input/output configuration may be changed at any time through the communications port. The I/O assignments are saved in nonvolatile memory and are automatically loaded when the unit is powered up. All boards are supplied with screw terminal plugs or ribbon connectors and captive mounting hardware.

SPECIFICATIONS

(Typical at +25°C and nominal power supply unless otherwise noted)

H1750: 24 digital inputs and digital outputs
H1770: 64 digital inputs and digital outputs

- Input voltage levels: 0-10V without damage
- Input switching levels: High, 3.5V min., Low, 1.0V max.
- Outputs: 0-10V, 15mA max. load
- Power requirements: +5Vdc ±0.25V @ 30mA max. (not including I/O module requirements)
- User selectable RS-232/RS-485 communications

Digital

- 8-bit CMOS microcomputer
- Nonvolatile memory storage for start up values — eliminates software initialization

Mechanical

H1750: 4.00" X 4.60"
H1770: 5.00" X 10.00"

ORDERING INFORMATION

SCM9B-H1700 DIGITAL I/O BOARDS

MODEL	DESCRIPTION
SCM9B-H1750	24 Digital Inputs/Outputs
SCM9B-H1770	64 Digital Inputs/Outputs
SCM9B-HCA1	4 Ribbon Connector Assembly

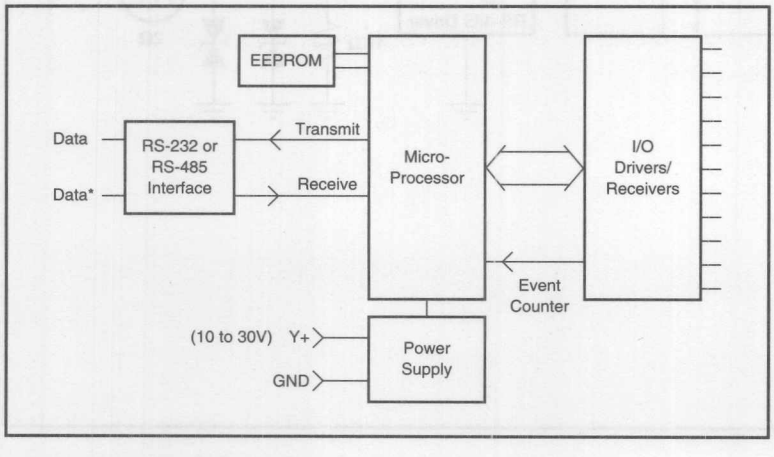


Figure 1. Block Diagram.

SCM9B

SCM9B-A1000/A2000
RS-232C/RS-485 Converters, RS-485 Repeaters

FEATURES

- COMPLETELY TRANSPARENT TO HOST SOFTWARE
- NO EXTERNAL FLOW CONTROL SIGNALS REQUIRED
- OPTICALLY-ISOLATED BIDIRECTIONAL DATA FLOW
- STANDARD BAUD RATES: 300 TO 115K BAUD
- AUTOMATIC INTERNAL RS-485 BUS SUPERVISION
- NETWORKING UP TO 4,000 FEET
- TRANSIENT SUPPRESSION ON RS485 DATA LINES
- INTERNAL JUMPER SELECTABLE TERMINATION RESISTORS
- INTERNAL 1KΩ BIASING RESISTORS ON RS-485 DATA LINES

DESCRIPTION

The A1000 and A2000 series converter boxes convert RS-232 communication signal levels to the correct electrical signals required by RS-485. The RS-485 communications standard is recommended when many SCM9B modules, or other addressable devices, must be connected to a host computer over long distances. The A1000 and A2000 converters allow communications bus lengths up to 4,000 feet and baud rates up to 115K baud using one twisted pair of wires.

The RS-485 standard allows for bidirectional data on the same pair of wires. Therefore, some means of arbitrating the data direction is required. The A1000 and A2000 automatically control the bus direction without external handshaking signals from the host. Therefore, host software written for half-duplex RS-232 may be used without modification, RS-485 bus control is completely transparent to the user.

The A1000 and A2000 can also operate as repeaters for RS-485. Repeaters are required to extend communications bus lengths or to allow more than 32 RS-485 devices to be connected to a communications bus. A repeater simply reamplifies, or boosts, existing RS-485 signals transmitted over long distances.

The A1000 converters are powered by either 115Vac or 230Vac. When ordering the A1000, specify desired power by adding –115 or –230 to the model number. The A1000 converters contain an internal + 24V, 1A power supply for powering SCM9B modules or accessory circuits — such as relays or 4-20mA transmitters. The internal power supply is protected against overloads and short circuits.

The A2000 converter boxes operate on a wide range of power supply input voltage: +10 to + 30Vdc unregulated.

AUTOMATIC RS-485 BUS SUPERVISION

The A1000 and A2000 automatically control bus direction in hardware without the need of handshaking signals from the host computer. As shown in Figure 1, the I/O control circuitry monitors the RS-232 receive (RX) input and both RS-485 drivers. The RS-485 drivers in the converters are always in the receive mode until either RS-485 driver, or RS-232 input, receives the start of a character to be retransmitted. When the start of a character is detected, the I/O circuitry enables the proper RS-485 driver for one character time at the selected baud rate. When the character time expires the drivers return to receive mode. Since the converters are bidirectional it does not matter which driver receives the character.

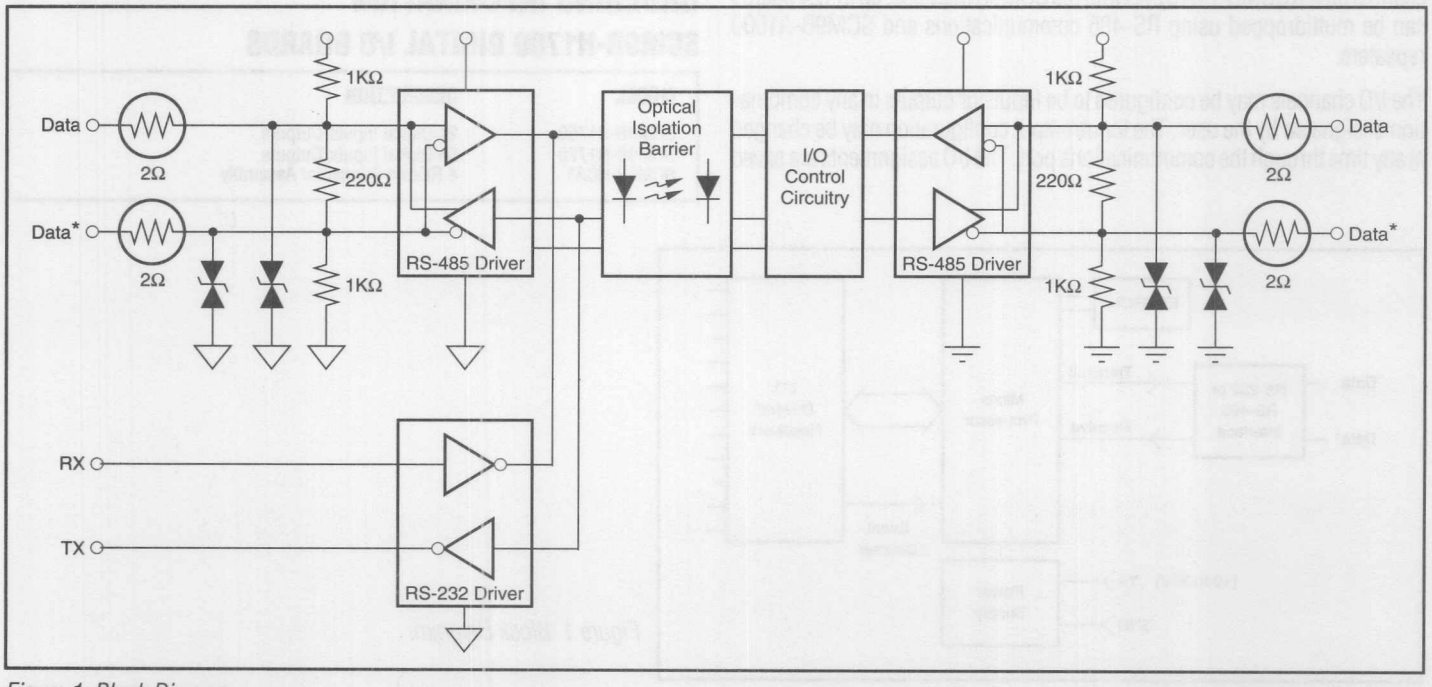


Figure 1. Block Diagram.

ISOLATION

The A1000 and A2000 converters are designed to protect host computers from destructive fault conditions that may occur on the RS-485 data lines. The host input connections on each converter are optically-isolated up to 1500VAC from the RS-485 connections. The optical-isolation will prevent short circuits to hazardous AC voltages on the RS-485 data lines, or static discharges, from reaching a host computer. The A1000 RS-485 output is connected to earth ground to provide a safe path for static discharge. The A2000 power supply ground should reference earth ground to provide a safe path for static discharge.

SURGE PROTECTION

The A1000 and A2000 RS-485 drivers contain internal surge-protection on the data lines. Internal high speed transient suppressors on each RS-485 data line protect the driver from dangerous voltage levels, or spikes, that can occur on the data lines. Thermistors are installed in series with each RS-485 data line to protect the drivers against overcurrent and excessive voltage conditions. In a fault condition the normally low impedance thermistor reacts by rapidly increasing its impedance thereby limiting excessive current flow. Once the fault condition is corrected the thermistor will return to its normally low impedance.

RS-485 TERMINATION

The RS-485 standard is highly immune to noise when each data line is properly biased and terminated. The A1000 and A2000 contain the proper termination technique for any RS-485 system. Each RS-485 driver is connected to pull-up and pull-down biasing resistors and termination resistors.

SPECIFICATIONS

Communications

- Max Common Mode Voltage: 1500Vrms, 1 minute duration
- Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Environmental

- Temperature Range (operating & storage): –25°C to 70°C
- Relative Humidity: 0-90% noncondensing

A1000 Power Specifications

- Power Requirements: 115VAC (order SCM9B-A1000-115) or 230VAC (order SCM9B-A1000-230) ±10%, 50-60Hz
- Power Consumption: 30W full load
- Power Supply Output: +24VDC at 1A

A2000 Power Specifications

- Power Requirements: +10 to +30 VDC unregulated
- Power Consumption (at +15VDC): Max. current w/RS-485 output short, 100mA
- Idle Current w/LEDs off, less than 10mA

Mechanical and Dimensions

- Case: Impact resistant ABS
- Weight: 2.8lbs. (A1000), 1.0lb. (A2000)
- Dimensions: 8.08"W X 2.50"H X 6.25"D (A1000)
  7.06"W X 1.53"H X 5.30"D (A2000)

ORDERING INFORMATION

SCM9B-A1000/A2000 CONVERTERS/REPEATERS

MODEL	DESCRIPTION
SCM9B-A1000-115	RS-232C/RS-485 Converter/Repeater, 115VAC
SCM9B-A1000-230	RS-232C/RS-485 Converter/Repeater, 230 VAC
SCM9B-A2000	RS-232C/RS-485 Converter/Repeater, +10 to+30VDC

SCM9B-S1000/S1200/S2000
Utility Software

S1000 AND S2000 UTILITY SOFTWARE

The S1000 utility software diskette contains executable programs that make 1000/3000/4000 series modules easier to use. The executable programs can be run on IBM PC/XT/AT or compatible computers. An executable menu-driven setup program is provided to simplify configuration of all user-selectable options such as address, baud rate, parity. Context-sensitive help is available during configuration for each selectable parameter.

The S1000 also contains programming examples written in high level languages such as BASIC, TURBO PASCAL and TURBO C. The examples are easily configured for either COM1: or COM2: ports and are provided in ASCII text format. A dumb terminal program is provided for diagnosis and system debugging. The S1000 is provided at no charge on request with a purchase order and is not copy protected.

```
 10 ' Display Program Menu
 20 CLS:PRINT"1 Log Data":PRINT"2 Print File"
 30 PRINT"3 End program":INPUT"Enter Selection : ";IN$
 40 ON VAL(IN$) GOTO 70,380,50
 50 END
 60 'Read and store module data
 70 CLS:INPUT"Input Module address ";ADDRESS$:C$="$"+ADDRESS$
 90 PRINT:INPUT"Name of Disk file to store data ";NAM$
110 PRINT:INPUT"Number of Samples to take ";X
130 CLS:OPEN "com1:300,n,8,1,rs,cs,cd,ds" AS #1
140 OPEN NAM$ FOR OUTPUT AS #2
160 FOR SAMPLE = 1 TO X:GOSUB 260:NEXT
220 CLOSE #1:CLOSE #2:GOTO 20
240 ' print command to module and receive data
260 PRINT #1,C$:RESPONSE$=""
265 T=0
270 T=T+1:IF T=450 THEN RESPONSE$="Timeout":goto 330
280 IF EOF(1) THEN GOTO 270 ELSE IN$=INPUT$(1,#1)
300 IF IN$="*" OR IN$="?" THEN GOTO 310 ELSE GOTO 265
310 IN$=INPUT$(1,#1):RESPONSE$=RESPONSE$+IN$
320 IF IN$<>CHR$(13) THEN GOTO 310 ELSE LOCATE 10,1
330 PRINT"Reading for Sample";SAMPLE;+" = ";+RESPONSE$
345 PRINT#2,RESPONSE$:LOCATE 5,48:PRINT"    ";:RETURN
360 'Get disk file name,display file information
380 CLS:PRINT:INPUT"Disk file name to print: ";NAM$
400 OPEN NAM$ FOR INPUT AS #2
420 IF EOF(2) THEN CLOSE #2:GOTO 450
440 INPUT #2,DAT$:PRINT DAT$:GOTO 420
450 PRINT:PRINT"Press any key for main menu ..";
460 IN$=INKEY$:IF IN$<>"" THEN GOTO 20 ELSE GOTO 460
```

This program allows the user to log data from a module. The data will be printed to the screen as well as stored to disk in a file specified by the user. The program will prompt the user for:

1. Correct module address.
2. Name of disk file to store module response data.
3. Number of samples to request from module and store to disk.

After all readings are taken and back to the main menu, contents of the disk can be printed to the screen by selecting "Print File" option from the main menu.

The S2000 utility software can rescale and reprogram a 2000 module, save & restore factory memory, setup a module and system configuration. The S2000 allows the user to save the factory calibration before making any changes to a module.

Rescaling and reprogramming can be done with or without an input excitation source. The program performs linear rescaling in two ways; by entering new minimum and maximum values to the program which computes the new values and sends them to the module, or by entering two points on the existing module transfer function to the program which calculates the new minimum and maximum values as shown below.

The reprogramming function provides menus to load, save, print, create and edit custom breakpoint tables. The store/refresh function can store a module's factory calibration to diskette or restore factory calibration from diskette to a module. The system configuration function selects baud rate, parity, communications port and assigns the disk drive. The setup function allows the user to select address, communications parameters, signal conditioning parameters and alarm status in a simple menu driven format.

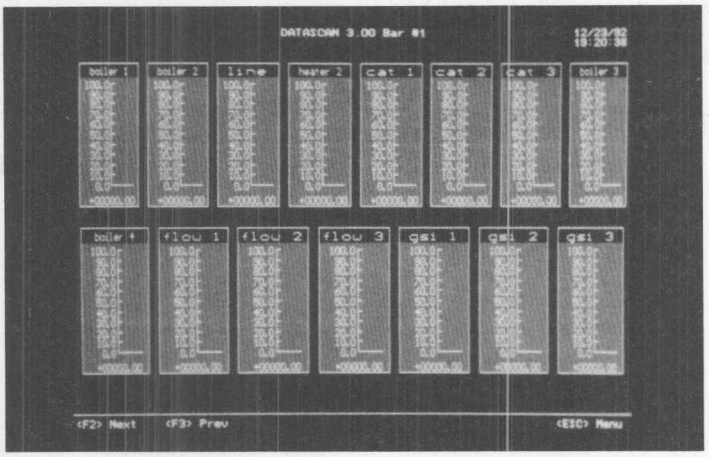
The S2000 utility software also provides a terminal mode that can communicate directly with a module. Terminal mode operates in two ways; either by entering a command and receiving a response or by continuously requesting data (continuous mode).

```
Model =  2251    Old Minimum =  +00000.00    Old Maximum = +00025.00

        Calibration point A                 Calibration point B

Excitation in mA  :  +00004.00    Excitation in mA  :  +00020.00
New Display value :  +00000.00    New Display value :  +00100.00
New Minimum value =  -00025.00    New Maximum value =  +00131.25

Send new values to Module (y/n/<ESC> for menu)?
```



SCM9B-S1200 DATASCAN Data Logging Software is a menu-driven program that acquires data from 1000 and 2000 series modules. The program uses menus to configure up to 64 analog inputs and 24 digital inputs. The acquired data is displayed as text or graphically using bar or trend graphs. The software is provided at no charge on request with a purchase order and is not copy protected.

Menus are used to set-up the modules for a data acquisition run, control start-up, data rates, display and log data to a printer. Each channel has a set-up screen status that allows you to specify your data acquisition hardware, and software options.

FEATURES

- MENU-DRIVEN (IBM-PC/XT/AT & COMPATIBLES).
- SCAN AND DISPLAY UP TO 64 1000/2000 MODULES.
- SCAN AND DISPLAY UP TO 24 DIGITAL INPUTS.
- REAL TIME DISPLAY OF ACQUIRED DATA.
- BARGRAPH, TREND AND TEXT DISPLAYS.
- LABEL CHANNELS — BOILER ROOM, FURNACE, ETC.
- SAVE & RECALL SYSTEM & MODULE SETUPS.
- SELECTABLE MODULE SCAN RATE.
- SELECTABLE LOG TO PRINTER RATE.
- SELECTABLE LOG DATA TO DISK RATE.
- SELECTABLE ALARM NOTIFICATION TO PRINTER.
- SUPPORTED DISPLAY TYPES: VGA, CGA, EGA, HERCULES.

PROCESS CONTROL SOFTWARE

Software device drivers for 1000/2000 Series modules are available for icon-driven process control software such as Paragon 550 from IntecControls and Genesis from Iconics Corporation. These programs operate on IBM and compatible personal computers and use high resolution graphics to illustrate process control strategies. Working in a CAD environment, these software packages transform a PC into a workstation for design, testing and implementing real-time process monitoring and control strategies without programming experience. Control algorithms such as PID, alarm management, real time and historical trending and system security via password are available in each package.

Sources for commercial software device drivers:

PARAGON
INTEC CONTROLS
55 West Street
Walpole, MA 02081
Phone: 508-660-1221

GENESIS ICONICS
100 Foxborough Boulevard
Foxborough, MA 02035
Phone: 508-543-8600

INSTATREND
DIANACHART, Inc.
101 Round Hill Drive
Rockaway, NJ 07866
Phone: 201-625-2299

AIMAX-PLUS
TA ENGINEERING CO. , INC.
1150 Moraga Way
Moraga, CA 94556
Phone: 510-376-8500

PACX
Automated Control Systems, Inc.
P.O. Box 49
Provo, UT 84603
Phone: 801-373-0678

LABTECH NOTEBOOK
Laboratory Technologies Corp.
400 Research Drive
Wilmington, MA 01887
Phone: 508-657-5400

ORDERING INFORMATION

MODEL	DESCRIPTION
SCM9B-S1000	Series S1000/3000/4000 Utility Software
SCM9B-S1200	Data Logging Software for 1000/2000 Series Modules
SCM9B-S2000	Series S2000 Utility Software

Isolated SCMD Digital I/O Modules

Dataforth offers a broad line of digital input and output modules and accessories providing safe, reliable interfacing to industrial measurement and control applications. When installed near individual field loads, our SCMD series I/O modules create a rugged protective isolation barrier, effective to 4kV, between the field and computer system. Use of these modules can also reduce field wiring costs while establishing an economical, manageable approach for system expansion and repair.

The SCMD Series

SCMD digital I/O modules are solid-state devices which send "ON" and "OFF" electrical signals to and from a computer. The input modules, depending on the type selected, convert AC or DC voltages to DC logic signals and send them to the computer system. Output modules work in the opposite direction, switching either AC or DC circuits on or off in response to logic-level voltage commands from the computer. SCMD modules are available in "full-sized" (the standard 0.6 inch) and "miniature" versions of four basic types: AC input, DC input, AC output, and DC output.

- **SCMD-IAC and IDC** full-sized input modules are used for sensing "ON" and "OFF" AC or DC voltage levels in the ranges 18-36, 90-140, and 180-280VAC or VDC and 3.3-32 and 10-60VDC. Models with low noise, fast switching, and other special features are also available.
- **SCMD-OAC and ODC** are full-sized output modules accepting 5VDC, 15VDC, or 24VDC inputs and providing several different output ranges, including 120VAC, 240VAC, 5-48VDC, 5-90VDC, and 5-150VDC. FET-output, fast switching, and other special options are also available.
- **SCMD-MIAC and MIDC** miniature input modules and **SCMD-MOAC and MODC** miniature output modules are functional equivalents of the full-sized modules but are 33% thinner and 20% shorter for increased density.

Key SCMD Features

- 4000V Optical Isolation
- UL, CSA Approved
- Industry Standard Packaging
- Input Modules Incorporate Input Filtering For Transient-Free Switching
- Complete Selection of Backpanels And Accessories
- Optional Low Noise, Fast Switching, FET-Input, Other Special Models

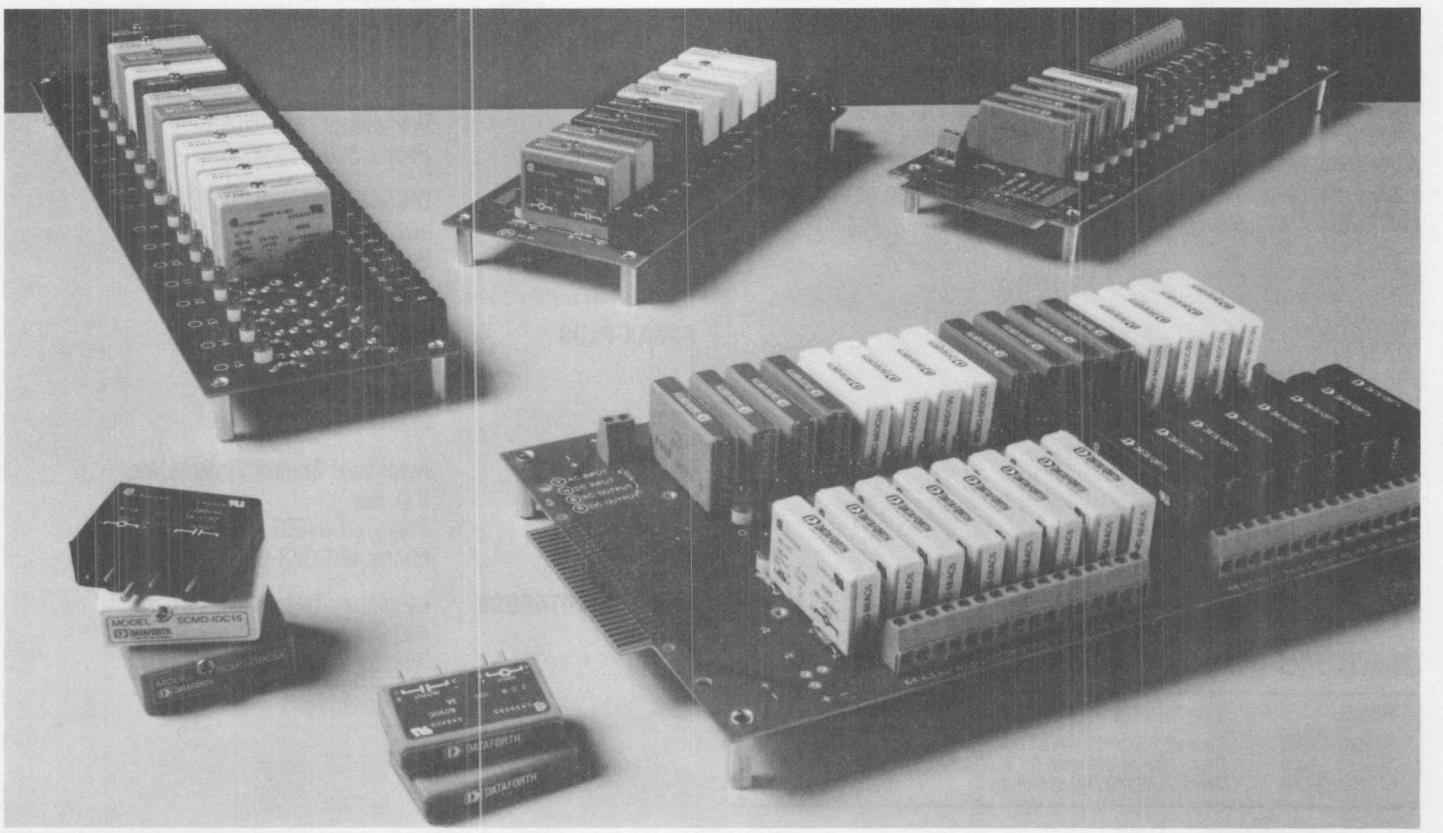
Applications

Input Modules Interface To:

- PROXIMITY SWITCHES
- LIMIT SWITCHES
- PHOTOELECTRIC SWITCHES
- TTL DEVICES
- PUSHBUTTONS

Output Modules For Switching AC and DC loads:

- RELAYS
- MOTOR STARTERS
- SOLENOIDS
- INDICATOR LAMPS



SELECTION GUIDE FOR SCMD SERIES ISOLATED DIGITAL I/O PRODUCTS

DIGITAL INPUT MODULES, FULL-SIZED

MODEL	INPUT RANGE	SUPPLY VOLTAGE
SCMD-IAC5	90 to 140VAC/DC	5V
SCMD-IAC5A	180 to 280VAC/DC	5V
SCMD-IAC5E	18 to 36VAC/DC	5V
SCMD-IAC15	90 to 140VAC/DC	15V
SCMD-IAC24	90 to 140VAC/DC	24V
SCMD-IAC24A	180 to 280VAC/DC	24V
SCMD-IDC5	3.3 to 32VDC	5V
SCMD-IDC5F	4.0 to 32VDC	5V
SCMD-IDC5N	10 to 60VDC	5V
SCMD-IDC15	3.3 to 32VDC	15V
SCMD-IDC24	3.3 to 32VDC	24V
SCMD-IDC24F	4.0 to 32VDC	24V
SCMD-IDC24N	10 to 60VDC	24V

DIGITAL OUTPUT MODULES, FULL-SIZED

MODEL	OUTPUT RANGE	SUPPLY VOLTAGE
SCMD-OAC5	12 to 140VAC	5V
SCMD-OAC5A	24 to 280VAC	5V
SCMD-OAC5ARN	24 to 280VAC, FAST	5V
SCMD-OAC5C	12 to 140VAC, NC	5V
SCMD-OAC5RN	12 to 140VAC, FAST	5V
SCMD-OAC15	12 to 140VAC	15V
SCMD-OAC24	12 to 14VDC	24V
SCMD-OAC24A	24 to 280VDC	24V
SCMD-ODC5	3.0 to 60VDC	5V
SCMD-ODC5A	3.0 to 250VDC	5V
SCMD-ODC5F	3.0 to 60VDC, FAST	5V
SCMD-ODC5MA	1.0 to 200VDC	5V
SCMD-ODC5MC	1.0 to 100VDC	5V
SCMD-ODC5ML	1.0 to 50VDC	5V
SCMD-ODC15	3.0 to 60VDC	15V
SCMD-ODC24	3.0 to 60VDC	24V
SCMD-ODC24A	3.0 to 250VDC	24V
SCMD-ODC24F	3.0 to 60VDC, FAST	24V

DIGITAL INPUT MODULES, MINIATURE

MODEL	INPUT RANGE	SUPPLY VOLTAGE
SCMD-MIAC5	90 to 140VAC/DC	5V
SCMD-MIAC5A	180 to 280VAC/DC	5V
SCMD-MIAC5E	18 to 36VAC/DC	5V
SCMD-MIAC24	90 to 140VAC/DC	24V
SCMD-MIAC24A	180 to 280VAC/DC	24V
SCMD-MIDC5	3.3 to 32VDC	5V
SCMD-MIDC5F	4.0 to 32VDC	5V
SCMD-MIDC5N	10 to 60VDC	5V
SCMD-MIDC24	3.3 to 32VDC	24V

DIGITAL OUTPUT MODULES, MINIATURE

MODEL	OUTPUT RANGE	SUPPLY VOLTAGE
SCMD-MOAC5	12 to 140VAC	5V
SCMD-MOAC5A	24 to 280VAC	5V
SCMD-MOAC5AR	24 to 280VAC, FAST	5V
SCMD-MOAC5R	12 to 140VAC, FAST	5V
SCMD-MOAC24	12 to 140VAC	24V
SCMD-MOAC24A	24 to 280VAC	24V
SCMD-MODC5	3.0 to 60VDC	5V
SCMD-MODC5A	3.0 to 250VDC	5V
SCMD-MODC5MA	1.0 to 200VDC	5V
SCMD-MODC5MC	1.0 to 100VDC	5V
SCMD-MODC5ML	1.0 to 50VDC	5V
SCMD-MODC24	3.0 to 60VDC	24V

DIGITAL I/O MODULE ACCESSORIES

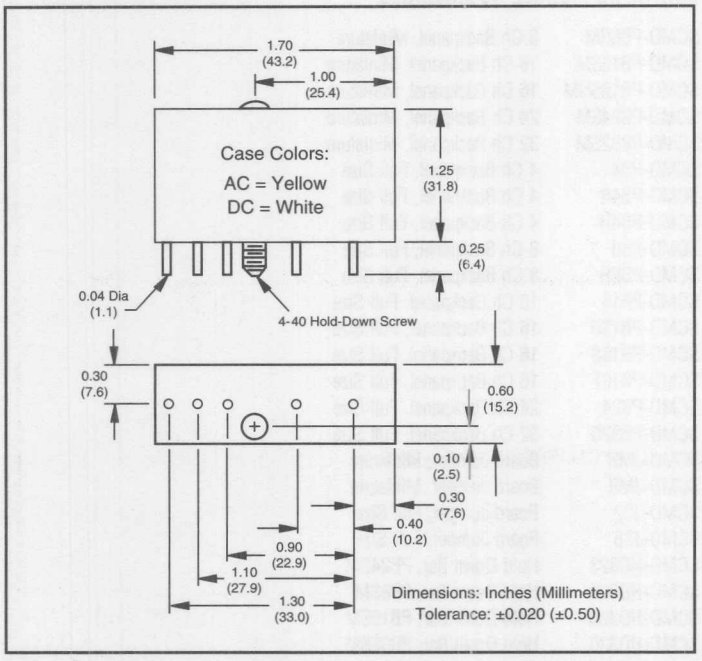
SCMD-PB8SM	8 Ch Backpanel, Miniature
SCMD-PB16SM	16 Ch Backpanel, Miniature
SCMD-PB16SHM	16 Ch Backpanel, Miniature
SCMD-PB24SM	24 Ch Backpanel, Miniature
SCMD-PB32SM	32 Ch Backpanel, Miniature
SCMD-PB4	4 Ch Backpanel, Full Size
SCMD-PB4R	4 Ch Backpanel, Full Size
SCMD-PB4H	4 Ch Backpanel, Full Size
SCMD-PB8	8 Ch Backpanel, Full Size
SCMD-PB8H	8 Ch Backpanel, Full Size
SCMD-PB16	16 Ch Backpanel, Full Size
SCMD-PB16H	16 Ch Backpanel, Full Size
SCMD-PB16S	16 Ch Backpanel, Full Size
SCMD-PB16T	16 Ch Backpanel, Full Size
SCMD-PB24	24 Ch Backpanel, Full Size
SCMD-PB32D	32 Ch Backpanel, Full Size
SCMD-JM2	Board Jumper, Miniature
SCMD-JM8	Board Jumper, Miniature
SCMD-JS2	Board Jumper, Full Size
SCMD-JS8	Board Jumper, Full Size
SCMD-HD323	Hold Down Bar, PB24SM
SCMD-HD328	Hold Down Bar, PB8SM
SCMD-HD329	Hold Down Bar, PB16SM
SCMD-HD330	Hold Down Bar, PB32SM

SCMD-IAC/IDC
Full-Sized Digital Input Modules

FEATURES

- 4KV OPTICAL ISOLATION
- AC INPUTS FOR 24V, 120V, 240V
- DC INPUTS FOR 3.3 TO 32V, 10 TO 60V
- UL RECOGNIZED, CSA CERTIFIED
- INDUSTRY-STANDARD PINOUT AND FOOTPRINT
- MIX AND MATCH TYPES ON BACKPANEL
- COLOR CODED BY FUNCTION
- FULL BACKPANEL AND ACCESSORY LINE
- IDEAL INTERFACE TO A VARIETY OF SWITCH SOURCES: PROXIMITY, LIMIT, SELECTOR, PUSH BUTTON, TOGGLE, PHOTOELECTRIC, OR TTL DEVICES

Physical Dimensions



DESCRIPTION

SCMD full-sized digital input modules provide highly reliable and safe interfaces to harsh industrial measurement and control applications. With SCMD modules installed near individual field signals, a reliable isolation barrier is provided between the field and computer system. Other benefits include reduction of field wiring costs and establishment of a cost effective and manageable method for system expansion and repair.

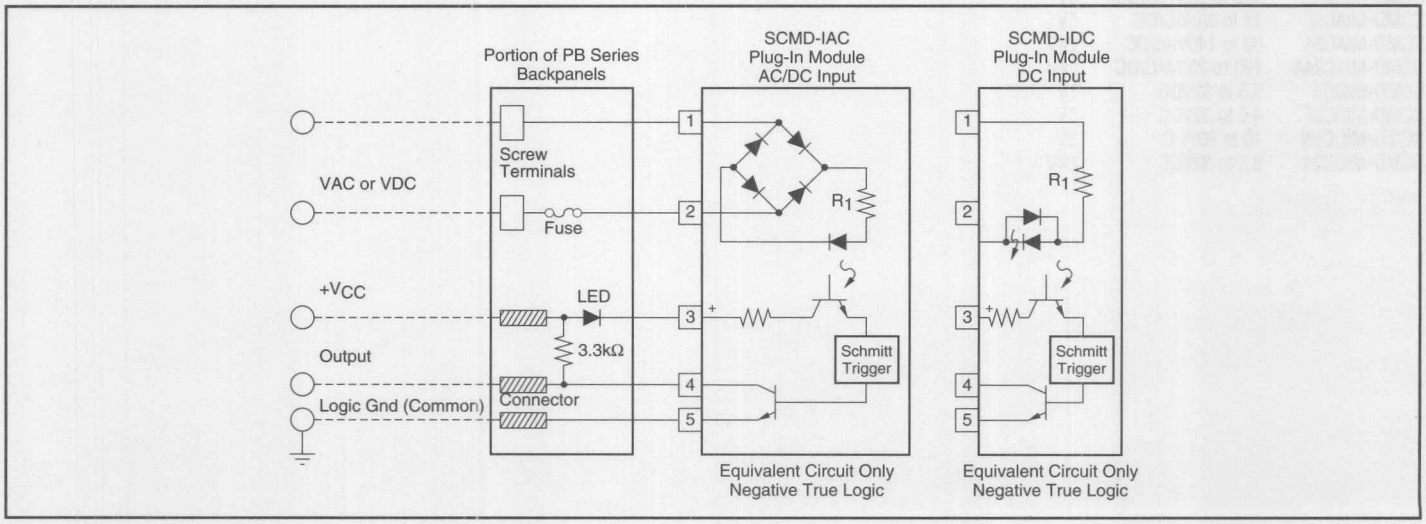
The SCMD-IAC digital input modules are used for sensing ON/OFF AC or DC voltage levels in the ranges of 18-36, 90-140 and 180-280VAC or VDC respectively. They are protected from damage due to high-voltage transients on the input signal.

The SCMD-IDC digital input modules provide DC voltage sensing at the lower ranges of 3.3 to 32VDC and 10 to 60VDC.

High voltage, low voltage, fast switching, and low noise options are available, designated by suffixes "A", "E", "F", and "N" respectively.

Eleven backpanels are available for mounting the SCMD full-sized digital I/O modules. See "Accessories" section.

Circuit Diagrams



SPECIFICATIONS

INPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**IAC5 IAC15 IAC24**	**IAC5A IAC24A**	**IAC5E**	**IDC5 IDC15 IDC24**	**IDC5F IDC24F**	**IDC5N IDC24N**
Nominal Voltage	120VAC	240VAC	24VAC	5-28VDC	5-28VDC	12-48VDC
Maximum Voltage	140VAC/VDC	280VAC/VDC	36VAC/VDC	32VDC	32VDC	60VDC
Minimum Voltage	90VAC/VDC	180VAC/VDC	18VAC/VDC	3.3VDC	4.0VDC	10VDC
Resistance [2] [3]	28KΩ	75KΩ	2KΩ	1KΩ	500Ω	2KΩ
Maximum Current [4]	5mArms	5mArms	10mArms	34mA	68mA	34mA
Drop-out Current [5]	2.0mArms	1.5mArms	1.0mArms	1.0mA	1.0mA	1.0mA
Allowable Current/	2.5mArms	2.0mArms	1.5mArms	1.5mA	1.5mA	1.5mA
Voltage for No Output [6]	50VAC/VDC	50VAC/VDC	10VAC/VDC	2.0VDC	2.0VDC	4.0VDC
OUTPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**IAC5 IAC5A IAC5E IDC5 IDC5F IDC5N**	**IAC15 IDC15**	**IAC24 IAC24A IDC24 IDC24F IDC24N**			
Nominal Logic Supply Voltage	5.0VDC	15.0VDC	24.0VDC			
Maximum Logic Supply Voltage	6.0VDC	18.0VDC	30.0VDC			
Minimum Logic Supply Voltage	3.0VDC	12.0VDC	20.0VDC			
Maximum Logic Supply Current [7]	16.0mA	16.0mA	16.0mA			
Maximum Logic Supply Leakage Current [8]	10.0µA	10.0µA	10.0µA			
Maximum Voltage [9]	30.0VDC	30.0VDC	30.0VDC			
Maximum Current [10]	50.0mA	50.0mA	50.0mA			
Maximum Leakage Current [11]	10.0µA	10.0µA	10.0µA			
Maximum Voltage Drop [12]	0.2VDC	0.2VDC	0.2VDC			
GENERAL SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**IAC5, IAC5A, IAC5E, IAC15, IAC24, IAC24A**	**IDC5 IDC15 IDC24**	**IDC5F IDC24F**	**IDC5N IDC24N**		
Operating Temperature Range	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C		
Storage Temperature Range	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C		
Maximum Turn-on Time [13]	20mSec	1.0mSec	0.05mSec	5.0mSec		
Maximum Turn-off Time [13]	30mSec	1.0mSec	0.10mSec	5.0mSec		
Input/Output Isolation Voltage [14]	4000VAC	4000VAC	4000VAC	4000VAC		
Input/Output Capacitance (typical)	8pF	8pF	8pF	8pF		
Line Frequency Range	47Hz to 63Hz	DC	DC	DC		

Notes: (1) Specifications apply to an ambient temperature of –30 to 80°C unless otherwise noted. (2) Resistance values for IAC modules are effective impedance values at 25°C. (3) Resistance values are ±10% at 25°C. (4) Measured at maximum specified input voltage, 25°C. (5) Defined as the maximum current allowed through the module's input to guarantee that the output will switch from "on" to "off". Higher currents may result in the output remaining in the "on" state. (6) Defined as the maximum current allowed through the module's input that will not switch the module's output state from "off" to "on". (7) With external LED status indicator at maximum specified logic supply voltage and 25°C. 18mA without external LED status indicator. (8) At maximum specified logic voltage and 25°C. (9) Maximum allowable applied voltage across open collector output transistor. (10) Maximum allowable sinking current through open collector output transistor. (11) At maximum output voltage and 25°C. (12) At maximum allowable output current and 25°C. (13) At nominal logic supply voltage, 25mA output sinking current, nominal input voltage and 25°C. (14) At 25°C for 1 second maximum duration.

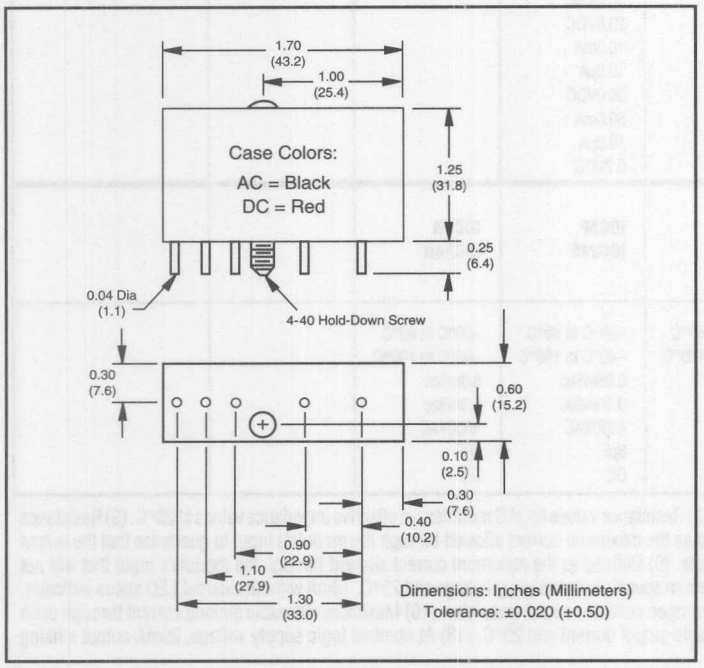
TABLE OF MODEL NUMBER SUFFIXES IDENTIFYING OPTIONAL FEATURES

Suffix	Feature
A	High voltage versions (240VAC for AC modules).
E	Low voltage 24VAC input for AC modules.
F	Fast-switching version of DC Modules.
N	Enhanced noise immunity version of DC modules.

FEATURES

- UL RECOGNIZED, CSA CERTIFIED
- AC MODULES HAVE HIGH CURRENT THYRISTOR WITH 100 AMP SURGE CAPABILITY
- ZERO OR RANDOM TURN-ON AVAILABLE IN AC MODULES
- MIX AND MATCH TYPES ON BACKPANEL
- 4KV OPTICAL ISOLATION (1500 VAC OPTICAL ISOLATION FOR FET DC OUTPUT MODULES)
- INDUSTRY STANDARD PINOUT AND FOOTPRINT
- 3.5 AMP AC MODULES PROVIDE EXTRA SWITCHING CAPABILITY
- FORM "A" OUTPUT, FORM "B" OPTIONAL ON CERTAIN MODELS (OAC5C)
- 5.0 AMP DC MODULES AVAILABLE

Physical Dimensions

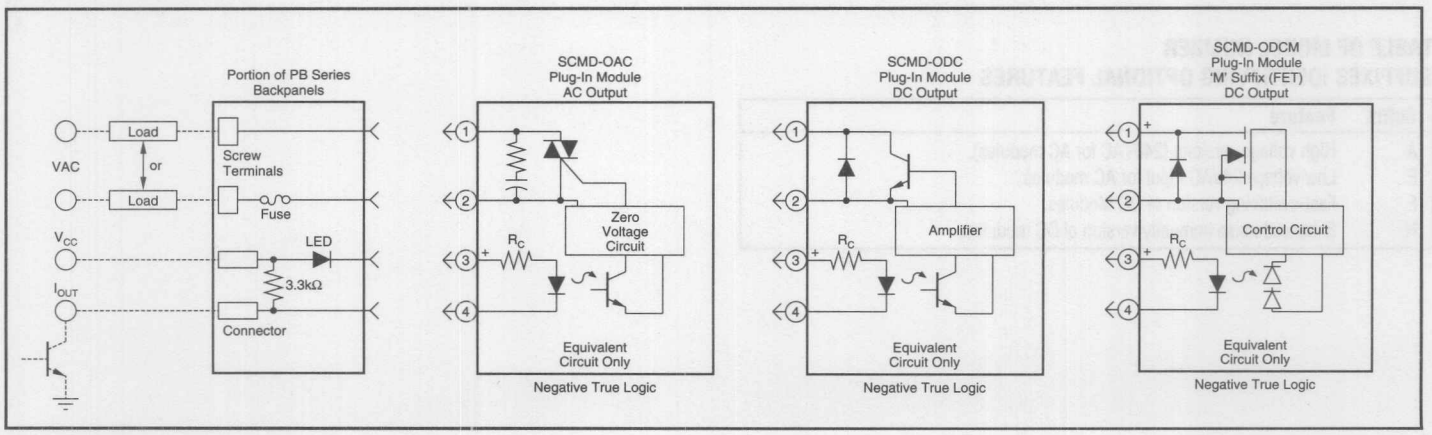


DESCRIPTION

The SCMD full-sized digital output modules are used for switching AC and DC loads such as relays, solenoids, motor starters, or indicator lamps. All models provide up to 4000Vrms of optical isolation between the field device and the control logic. The AC output modules incorporate zero voltage switching and an RC snubber circuit which allows switching heavy inductive loads. Functionality is denoted by case color—AC modules are black, and DC modules are red.

Eleven backpanels are available for mounting the SCMD full-sized digital I/O modules. See "Accessories" section.

Circuit Diagrams



SPECIFICATIONS

INPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**OAC5 OAC5A OAC5ARN OAC5C OAC5RN**	**ODC5 ODC5A ODC5F ODC5MA ODC5MC ODC5ML**	**OAC15 ODC15**	**OAC24 OAC24A ODC24 ODC24A ODC24F**			
Nominal Voltage	5.0VDC	5.0VDC	15.0VDC	24.0VDC			
Minimum Voltage [2]	2.75VDC	2.75VDC	9.0VDC	18.0VDC			
Maximum Voltage	8.0VDC	8.0VDC	18.0VDC	32.0VDC			
Drop-Out Voltage	1.0VDC	1.0VDC	1.0VDC	1.0VDC			
Maximum Current [3]	20.0mA	18.0mA	16.0mA	13.0mA			
Resistance [4]	220Ω	250Ω	1000Ω	2000Ω			
OUTPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**OAC5 OAC5C OAC5RN OAC15 OAC24**	**OAC5A OAC5ARN OAC24A**	**ODC5 ODC15 ODC24**	**ODC5A ODC24A**	**ODC5F ODC24F**	**ODC5MA**	**ODC5MC**	**ODC5ML**
Nominal Line Voltage	120VAC	240VAC	5-48VDC	5-150VDC	5-48VDC	5-150VDC	5-90VDC	5-48VDC
Minimim Line Voltage	12VAC	24VAC	3.0VDC	3.0VDC	3.0VDC	1.0VDC	1.0VDC	1.0VDC
Maximum Line Voltage	140VAC	280VAC	60VDC	250VDC	60VDC	200VDC	100VDC	50VDC
Max Off-State Voltage [5]	400Vpeak	600Vpeak	60VDC	250VDC	60VDC	200VDC	100VDC	50VDC
Max Off-State Leakage [6]	3.0mArms	6.0mArms	500µA	2.0mA	1.0mA	10µA	10µA	10µA
Static Off-State dv/dt [7]	200V/µsec	200V/µsec	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Rated On-State Current [8]	3.5Arms	3.5Arms	3.0A	1.0A	3.0A	3.0A	5.0A	5.0A
Minimum On-State Current	50mArms	50mArms	10mA	10mA	10mA	1.0mA	1.0mA	1.0mA
Maximum Surge Current [9]	100Apeak	100Apeak	5.0A	5.0A	5.0A	10A	10A	10A
On-State Voltage Drop or Resistance [10]	1.6VAC	1.6VAC	1.5VDC	1.5VDC	1.5VDC	0.25Ω	0.10Ω	0.05Ω
GENERAL SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**OAC5 OAC5A OAC5C OAC15 OAC24 OAC24A**	**OAC5RN OAC5ARN**	**ODC5 ODC5A ODC15 ODC24 ODC24A**	**ODC5F ODC24F**	**ODC5MA ODC5MC ODC5ML**			
Operating Temperature Range	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C			
Storage Temperature Range	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C			
Maximum Turn-on Time [11]	8.33mSec	0.1mSec	0.1mSec	0.025mSec	1.0mSec			
Maximum Turn-off Time [11]	8.33mSec	8.33mSec	0.75mSec	0.05mSec	0.05mSec			
Input/Output Isolation Voltage [12]	4000VAC	4000VAC	4000VAC	4000VAC	1500VAC			
Input/Output Capacitance (typical)	8pF	8pF	8pF	8pF	8pF			
Line Frequency Range	47Hz to 63Hz	47Hz to 63Hz	DC	DC	DC			

Notes: (1) Specifications apply to an ambient temperature of –30 to 80°C unless otherwise noted. (2) Without external LED status indicator. Add 1.7 volt for external LED if utilized. (3) At nominal input voltage, without external LED status indicator. (4) ±10% at 25°C. (5) Maximum 1 minute duration for OAC modules when applied as a DC voltage rather than peak AC voltage. (6) At maximum line voltage, 25°C for OAC modules, and 80° C for ODC modules. (7) Minimum dv/dt per EIA/NARM RS443, method RS397. dv/dt ratings do not apply to ODC modules. (8) At 40°C, derate OAC modules by 58mA/°C to 80° C; derate ODC, ODCxMC and ODCxML modules by 50 mA/°C to 80°C; derate ODCxMA modules by 30 mA/°C to 80°C. CSA rating of OAC modules is 3.0 Arms at 40°C. (9) At 25°C. Maximum duration: 1 AC cycle for OAC modules, 1 second for ODC modules. (10) At maximum rated on-state current and 25 C. (11) At maximum line voltage, maximum rated output current, nominal input voltage, 25°C. Switching speed of OAC modules based upon 60Hz line frequency. (12) At 25°C for 1 second maximum duration.

TABLE OF MODEL NUMBER SUFFIXES IDENTIFYING OPTIONAL FEATURES

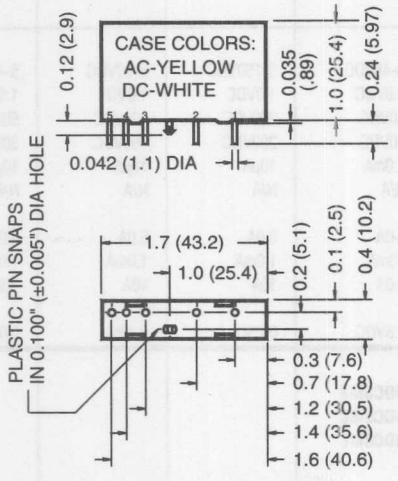
Suffix	Feature
A	High voltage versions (240VAC for AC modules, 250VDC for DC modules).
C	Normally closed output version of OAC module.
F	Fast-switching version of ODC modules.
MA	FET output version of DC module, 3.0A, 200VDC.
MC	FET output version of DC module, 5.0A, 100VDC.
ML	FET output version of DC module, 5.0A, 50VDC.
RN	Random AC voltage turn-on.

SCMD-MIAC/MIDC
Miniature Digital Input Modules

FEATURES

- PLUG INTO BACKPANELS FOR MINIATURE OR FULL-SIZED MODULES
- AC INPUTS FOR 24 V, 120 V, 240 V
- DC INPUTS FOR 3.3 TO 32 V, 10 TO 60 V
- UL RECOGNIZED, CSA CERTIFIED
- 4KV OPTICAL ISOLATION
- OPEN-COLLECTOR OUTPUT
- INDUSTRY-STANDARD PINOUT AND FOOTPRINT

Physical Dimensions



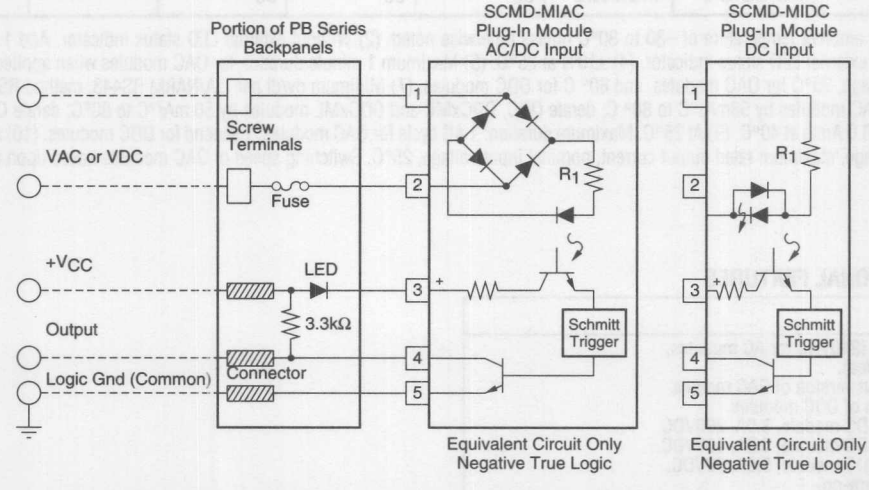
Dimensions: Inches (Millimeters)
Tolerance: ±0.020 (±0.50)

DESCRIPTION

SCMD-MIAC and -MIDC series modules are functional equivalents of, but 33% thinner (0.4" thick) and 20% shorter than the 0.6 inch full-sized series of single-point digital input modules. They employ a plastic retaining pin instead of a metal screw for fast and secure module retention. These series modules are intended for use with the smaller I/O module backpanels (e.g. SCMD-PB8SM), but they may be installed in the standard PB module backpanels.

Five backpanels are available for mounting SCMD-M digital I/O modules. See "Accessories" section.

Circuit Diagrams



SPECIFICATIONS

INPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**MIAC5 MIAC24**	**MIAC5A MIAC24A**	**MIAC5E**	**MIDC5 MIDC24**	**MIDC5F**	**MIDC5N**
Nominal Voltage	120VAC	240VAC	24VAC	5-28VDC	5-28VDC	12-48VDC
Maximum Voltage	140VAC/VDC	280VAC/VDC	36VAC/VDC	32VDC	32VDC	60VDC
Minimum Voltage	90VAC/VDC	180VAC/VDC	18VAC/VDC	3.3VDC	4.0VDC	10VDC
Input Resistance [2] [3]	28KΩ	75KΩ	2KΩ	1KΩ	500Ω	2KΩ
Maximum Current [4]	5mArms	5mArms	10mArms	34mA	68mA	34mA
Drop-out Current [5]	2.0mArms	1.5mArms	1.0mArms	1.0mA	1.0mA	1.0mA
Allowable Current/	2.5mArms	2.0mArms	1.5mArms	1.5mA	1.5mA	1.5mA
Voltage for No Output [6]	50VAC/VDC	50VAC/VDC	10VAC/VDC	2.0VDC	2.0VDC	4.0VDC
OUTPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**MIAC5 MIAC5A MIAC5E MIDC5 MIDC5F MIDC5N**	**MIAC24 MIAC24A MIDC24**				
Nominal Logic Supply Voltage	5.0VDC	24.0VDC				
Maximum Logic Supply Voltage	6.0VDC	30.0VDC				
Minimum Logic Supply Voltage	3.0VDC	20.0VDC				
Maximum Logic Supply Current [7]	16.0mA	16.0mA				
Maximum Logic Supply Leakage Current [8]	10.0µA	10.0µA				
Maximum Voltage [9]	30.0VDC	30.0VDC				
Maximum Current [10]	50.0mA	50.0mA				
Maximum Leakage Current [11]	10.0µA	10.0µA				
Maximum Voltage Drop [12]	0.2VDC	0.2VDC				
GENERAL SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**MIAC5, MIAC5A, MIAC5E, MIAC24, MIAC24A**	**MIDC5 MIDC24**	**MIDC5F**	**MIDC5N**		
Operating Temperature Range	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C		
Storage Temperature Range	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C		
Maximum Turn-on Time [13]	20mSec	1.0mSec	0.05mSec	5.0mSec		
Maximum Turn-off Time [13]	30mSec	1.0mSec	0.10mSec	5.0mSec		
Input/Output Isolation Voltage [14]	4000VAC	4000VAC	4000VAC	4000VAC		
Input/Output Capacitance (typical)	8pF	8pF	8pF	8pF		
Line Frequency Range	47Hz to 63Hz	DC	DC	DC		

Notes: (1) Specifications apply to an ambient temperature of –30 to 80°C unless otherwise noted. (2) Resistance values for IAC modules are effective impedance values at 25°C. (3) Resistance values are ±10% at 25°C. (4) Measured at maximum specified input voltage, 25°C. (5) Defined as the maximum current allowed through the module's input to guarantee that the output will switch from "on" to "off". Higher currents may result in the output remaining in the "on" state. (6) Defined as the maximum current allowed through the module's input that will not switch the module's output state from "off" to "on". (7) With external LED status indicator at maximum specified logic supply voltage and 25°C. 18mA without external LED status indicator. (8) At maximum specified logic voltage and 25°C. (9) Maximum allowable applied voltage across open collector output transistor. (10) Maximum allowable sinking current through open collector output transistor. (11) At maximum output voltage and 25°C. (12) At maximum allowable output current and 25°C. (13) At nominal logic supply voltage, 25mA output sinking current, nominal input voltage and 25°C. (14) At 25°C for 1 second maximum duration.

TABLE OF MODEL NUMBER SUFFIXES IDENTIFYING OPTIONAL FEATURES

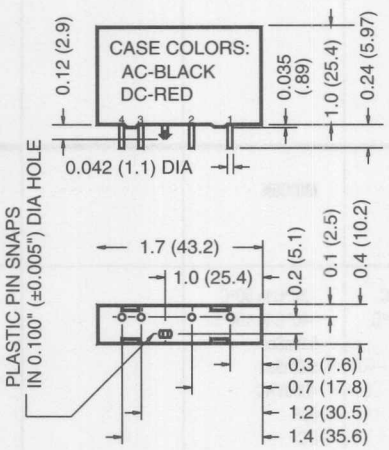
Suffix	Feature
A	High voltage versions (240VAC for AC modules).
E	Low voltage 24VAC input for AC modules.
F	Fast-switching version of DC modules.
N	Enhanced noise immunity version of DC modules.

SCMD-MOAC/MODC
Miniature Digital Output Modules

FEATURES

- UL RECOGNIZED, CSA CERTIFIED
- AC MODULES HAVE HIGH CURRENT THYRISTOR WITH 100 AMP SURGE CAPABILITY
- ZERO OR RANDOM TURN-ON AVAILABLE IN AC MODULES
- PLUG INTO BACKPANELS FOR MINIATURE OR FULL-SIZED MODULES
- 4KV OPTICAL ISOLATION (1500 VAC OPTICAL ISOLATION FOR FET DC OUTPUT MODULES)
- INDUSTRY STANDARD PINOUT AND FOOTPRINT
- 3.5 AMP AC MODULES PROVIDE EXTRA SWITCHING CAPABILITY
- 5.0 AMP DC MODULES AVAILABLE

Physical Dimensions



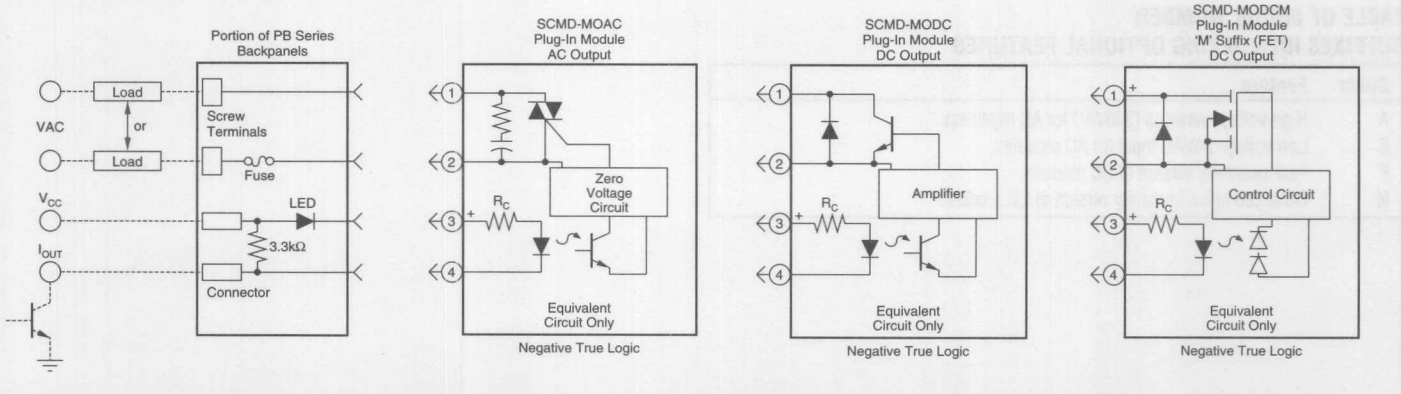
Dimensions: Inches (Millimeters)
Tolerance: ±0.020 (±0.50)

DESCRIPTION

SCMD-MOAC and -MODC series modules are functional equivalents of, but 33% thinner (0.4" thick) and 20% shorter than the 0.6 inch full-sized series of single-point digital output modules. They employ a plastic retaining pin instead of a metal screw for fast and secure module retention. These series modules are intended for use with the smaller I/O module backpanels (e.g. SCMD-PB8SM), but they may be installed in the standard PB module backpanels.

Five backpanels are available for mounting SCMD-M digital I/O modules. See "Accessories" section .

Circuit Diagrams



SPECIFICATIONS

INPUT SPECIFICATIONS [1] MODEL NUMBER **SCMD-**	**MOAC5** **MOAC5A** **MOAC5AR** **MOAC5R**	**MODC5** **MODC5A** **MODC5MA** **MODC5MC** **MODC5ML**	**MOAC24** **MOAC24A** **MODC24**				
Nominal Voltage	5.0VDC	5.0VDC	24.0VDC				
Minimum Voltage [2]	2.75VDC	2.75VDC	18.0VDC				
Maximum Voltage	8.0VDC	8.0VDC	32.0VDC				
Drop-Out Voltage	1.0VDC	1.0VDC	1.0VDC				
Maximum Current [3]	20.0mA	18.0mA	13.0mA				
Resistance [4]	220Ohms	250Ohms	2000Ohms				
OUTPUT SPECIFICATIONS [1] **MODEL NUMBER SCMD-**	**MOAC5** **MOAC5R** **MOAC24**	**MOAC5A** **MOAC5AR** **MOAC24A**	**MODC5** **MODC24**	**MODC5A**	**MODC5MA**	**MODC5MC**	**MODC5ML**
Nominal Line Voltage	120VAC	240VAC	5-48VDC	5-150VDC	5-150VDC	5-90VDC	5-48VDC
Minimim Line Voltage	12VAC	24VAC	3.0VDC	3.0VDC	1.0VDC	1.0VDC	1.0VDC
Maximum Line Voltage	140VAC	280VAC	60VDC	250VDC	200VDC	100VDC	50VDC
Max Off-State Voltage [5]	400Vpeak	600Vpeak	60VDC	250VDC	200VDC	100VDC	50VDC
Max Off-State Leakage [6]	3.0mArms	6.0mArms	500µA	2.0mA	10µA	10µA	10µA
Static Off-State dv/dt [7]	200V/µsec	200V/µsec	N/A	N/A	N/A	N/A	N/A
Maximum Rated On-State Current [8]	3.5Arms	3.5Arms	3.0A	1.0A	3.0A	5.0A	5.0A
Min On-State Current	50mArms	50mArms	10mA	10mA	1.0mA	1.0mA	1.0mA
Max Surge Current [9]	100Apeak	100Apeak	5.0A	5.0A	10A	10A	10A
On-State Voltage Drop or Resistance [10]	1.6VAC	1.6VAC	1.5VDC	1.5VDC	0.25 Ω	0.10 Ω	0.05 Ω
GENERAL SPECIFICATIONS [1] **MODEL NUMBER SCMD-**	**MOAC5** **MOAC5A** **MOAC24** **MOAC24A**	**MOAC5R** **MOAC5AR**	**MODC5** **MODC5A** **MODC24**	**MODC5MA** **MODC5MC** **MODC5ML**			
Operating Temperature Range	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C	–30°C to 80°C			
Storage Temperature Range	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C	–40°C to 100°C			
Maximum Turn-on Time [11]	8.33mSec	0.1mSec	0.1mSec	1.0mSec			
Maximum Turn-off Time [11]	8.33mSec	8.33mSec	0.75mSec	0.05mSec			
Input/Output Isolation Voltage [12]	4000VAC	4000VAC	4000VAC	1500VAC			
Input/Output Capacitance (typical)	8pF	8pF	8pF	8pF			
Line Frequency Range	47Hz to 63Hz	47Hz to 63Hz	DC	DC			

Notes: (1) Specifications apply to an ambient temperature of –30 to 80°C unless otherwise noted. (2) Without external LED status indicator. Add 1.7 volt for external LED if utilized. (3) At nominal input voltage, without external LED status indicator. (4) ±10% at 25°C. (5) Maximum 1 minute duration for OAC modules when applied as a DC voltage rather than peak AC voltage. (6) At maximum line voltage, 25°C for OAC modules, and 80° C for ODC modules. (7) Minimum dv/dt per EIA/NARM RS443, method RS397. dv/dt ratings do no apply to ODC modules. (8) At 40°C, derate OAC modules by 58mA/°C to 80° C; derate ODC, ODCxMC and ODCxML modules b 50 mA/°C to 80°C; derate ODCxMA modules by 30 mA/°C to 80°C. CSA rating of OAC modules is 3.0 Arms at 40°C. (9) At 25°C. Maximum duration: 1 AC cycle for OAC modules, 1 second for ODC modules. (10) At maximum rated on-state current and 25 C. (11) At maximum line voltage, maximum rated output current, nominal input voltage, 25°C. Switching speed of OAC modules based upon 60Hz line frequency. (12) At 25°C for 1 second maximum duration.

TABLE OF MODEL NUMBER SUFFIXES IDENTIFYING OPTIONAL FEATURES

Suffix	Feature
A	High voltage versions (240 VAC for AC modules, 250 VDC for DC modules).
F	Fast-switching version of DC modules.
MA	FET output version of DC module, 3.0A, 200VDC.
MC	FET output version of DC module, 5.0A, 100VDC.
ML	FET output version of DC module, 5.0A, 50VDC.
R	Random AC voltage turn-on.

Accessories for SCMD Digital I/O Modules

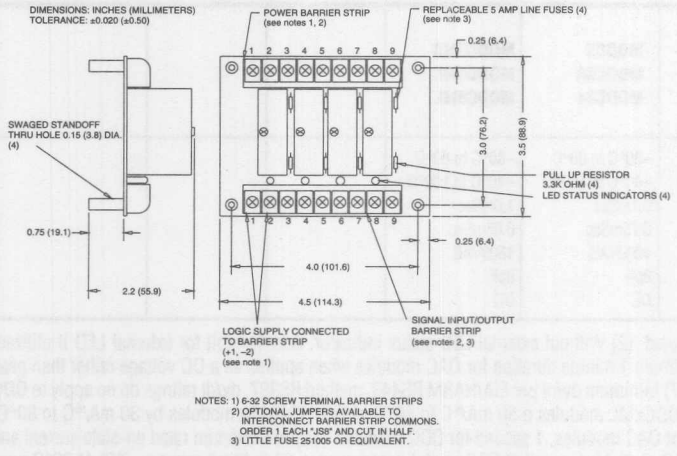
SCMD DIGITAL I/O MODULE BACKPANELS

FEATURES

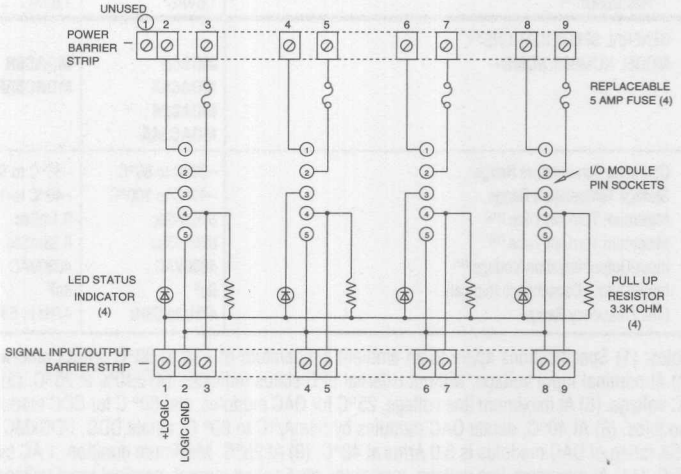
- PLUG-COMPATIBLE LOGIC CONNECTIONS ON 8, 16, 24 AND 32 POSITION BACKPANELS. SCREW TERMINAL BARRIER BLOCK FOR LOGIC CONNECTIONS ON 4-POSITON BACKPANELS.
- SCREW TERMINAL BARRIER BLOCK FOR LOAD CONNECTIONS
- RESIDENT PULL-UP RESISTORS
- 5 AMP FIELD-REPLACEABLE FUSES (LITTLEFUSE #251005 OR EQUIVALENT)
- LEDS INDICATE LOGIC STATUS
- ALL EVEN-NUMBERED LOGIC CONNECTIONS ARE LOGIC GROUND
- INPUT AND OUTPUT MODULES ACCEPTED INTERCHANGEABLY
- OPERATE WITH 5, 15 OR 24 VOLT LOGIC SUPPLIES
- CAPTIVE-SCREW RETAINING SYSTEM FOR STANDARD-SIZE MODULES. PIN RETAINING SYSTEM FOR MINATURE MODULES. OPTIONAL HOLD DOWN BAR FOR MINIATURE MODULES.
- PB4, PB4R, PB8, PB16, PB16S, PB16T, AND PB24, RECOGNIZED AND CSA CERTIFIED. ADDITIONAL APPROVALS PENDING. CONSULT FACTORY FOR UPDATED LIST.

FOR FULL-SIZED MODULES (compatible with miniature modules)

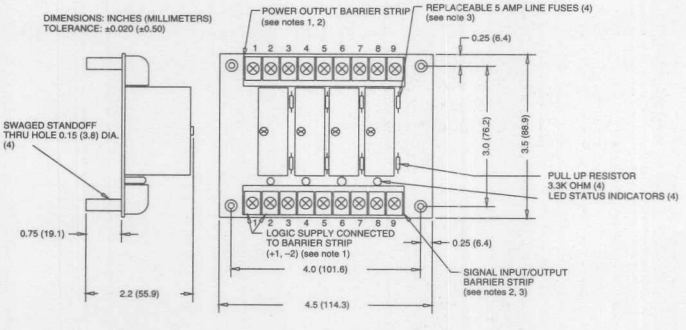
SCMD-PB4



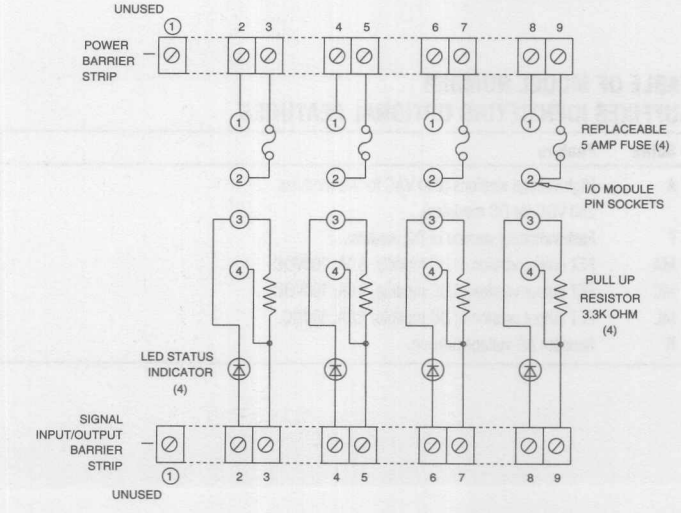
NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS
2) OPTIONAL JUMPERS AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS8" AND CUT IN HALF.
3) LITTLE FUSE 251005 OR EQUIVALENT.



SCMD-PB4R



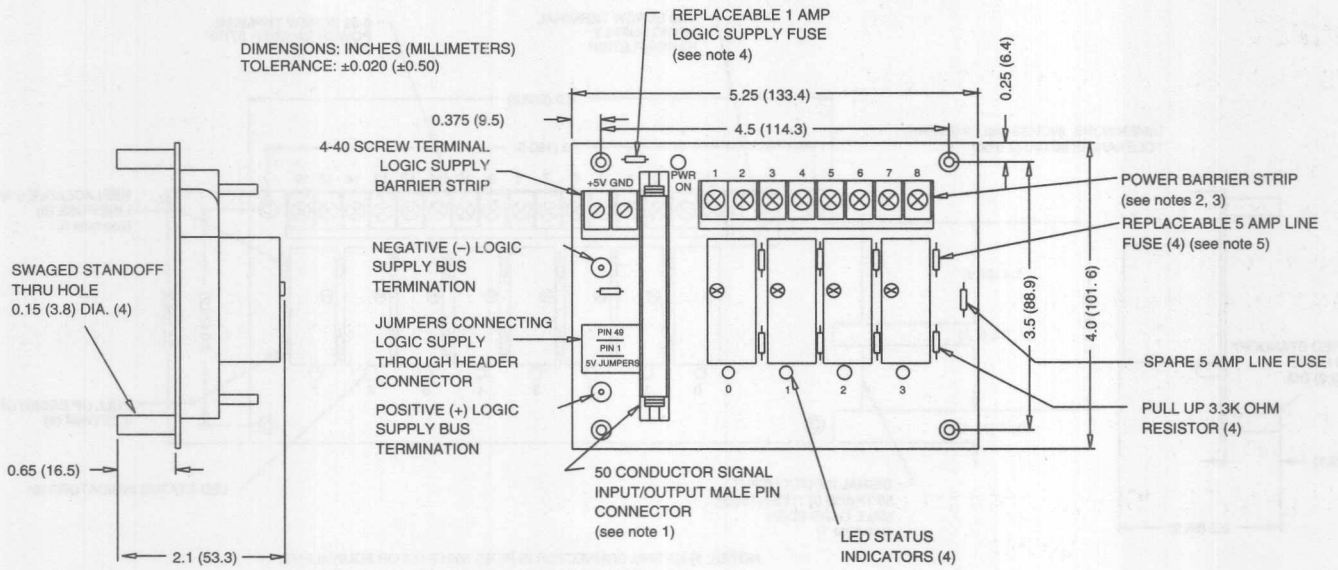
NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS.
2) OPTIONAL JUMPERS AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS8" AND CUT IN HALF.
3) LITTLE FUSE 251005 OR EQUIVALENT.
4) PB4R ACCEPTS ONLY OUTPUT MODULES. INPUT MODULES WILL NOT PLUG INTO PB4R.



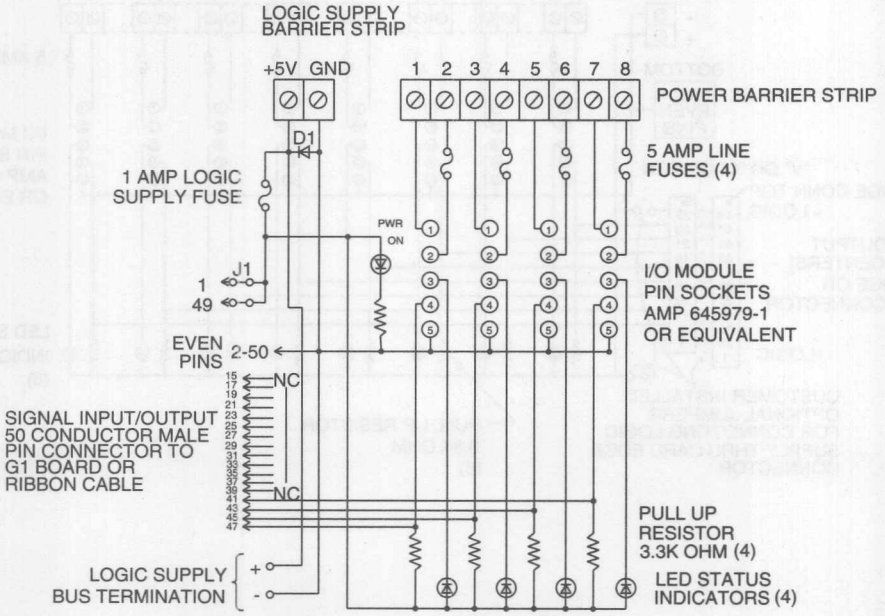
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB4H



NOTES: 1) CONNECTOR IS BERG 65863-145 OR EQUIVLAENT.
2) 6-32 SCREW TERMINAL BARRIER STRIPS.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS8" AND CUT IN HALF.
4) LITTLE FUSE 251001 OR EQUIVALENT.
5) LITTLE FUSE 251005 OR EQUIVALENT.

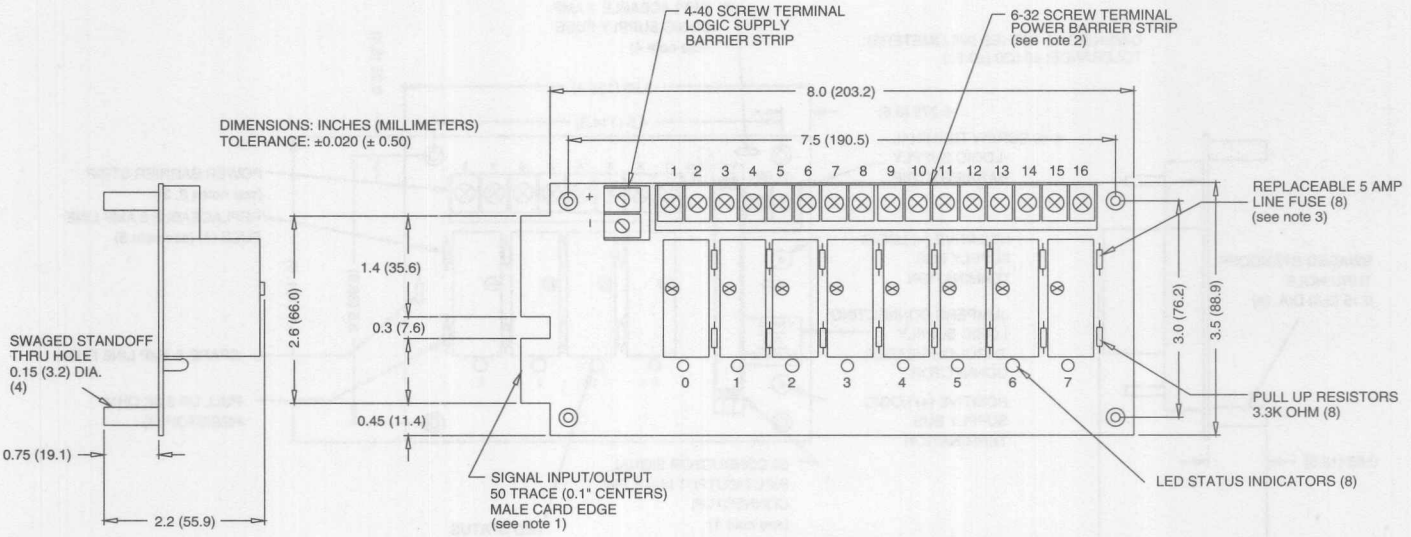


SCMD

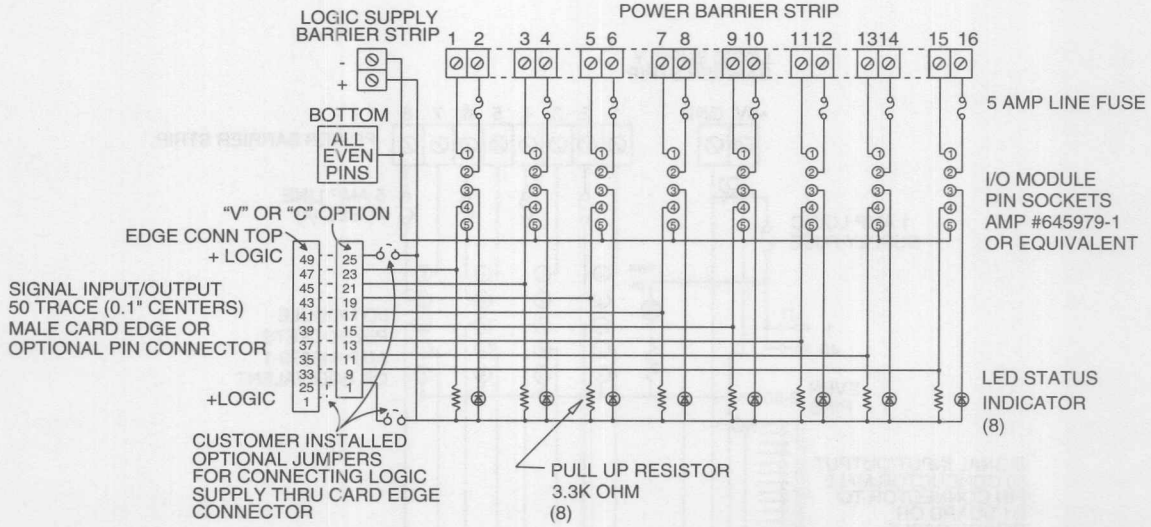
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB8

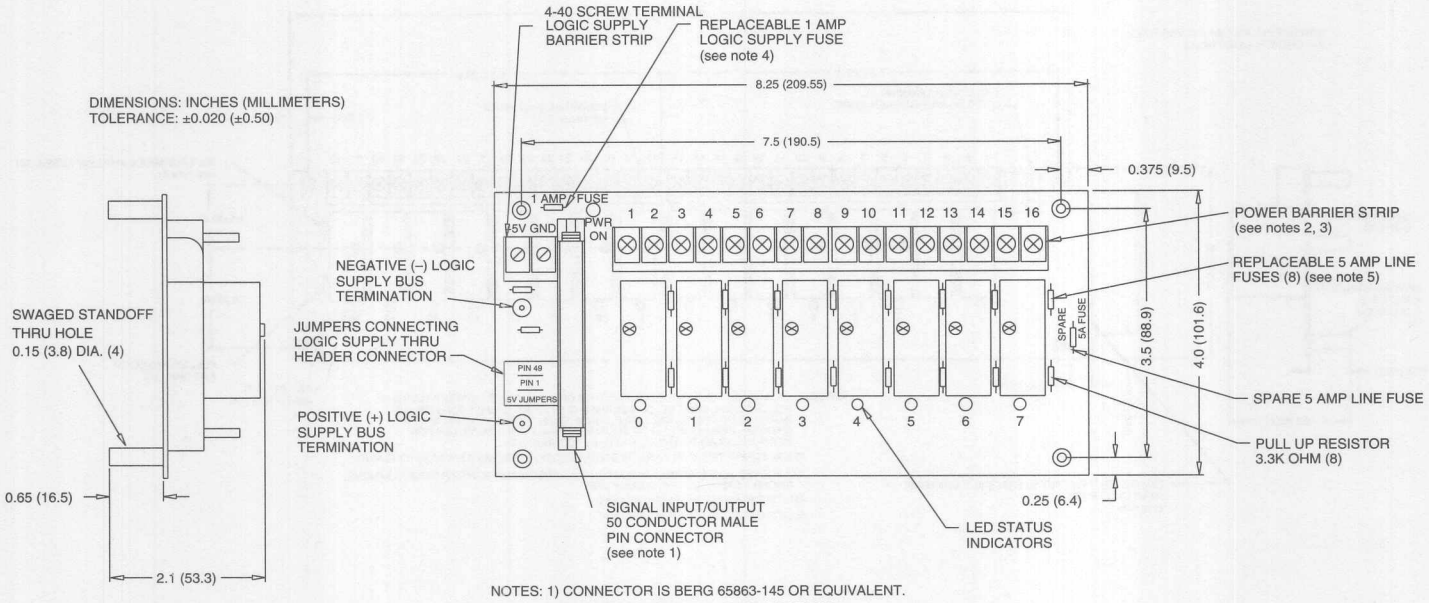


NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX "V" FOR OPTIONAL BERG 65863-075 OR EQUIVALENT 26 CONDUCTOR PERPENDICULAR-TO-THE-BOARD MALE PIN CONNECTOR.
2) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS8".
3) LITTLE FUSE 251005 OR EQUIVALENT.

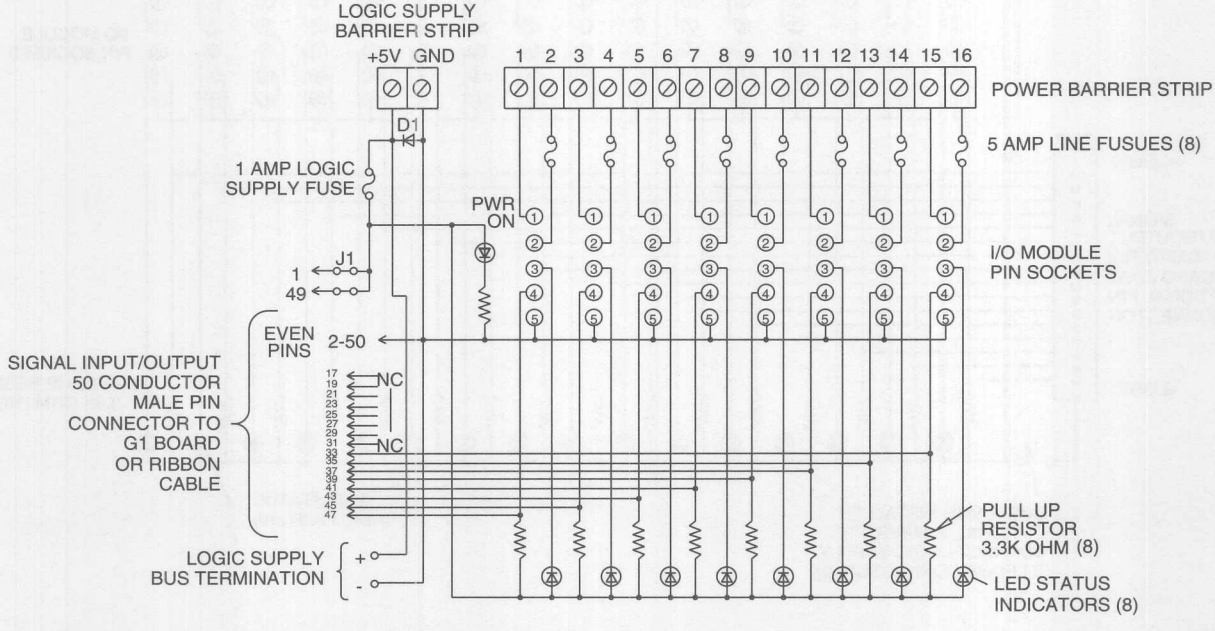


FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB8H



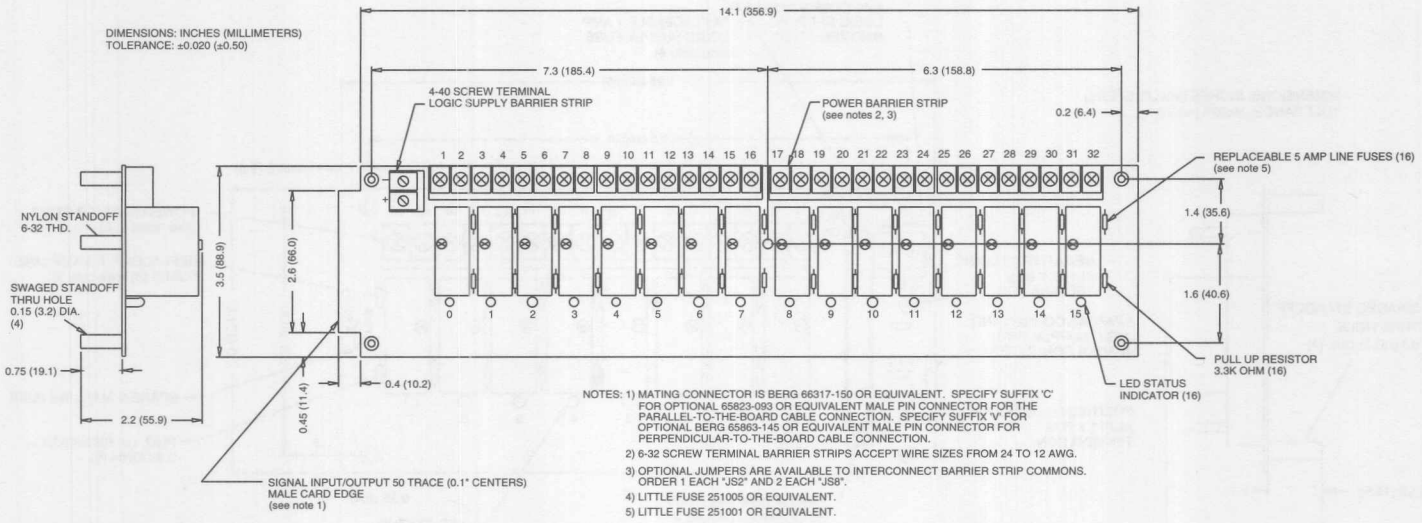
NOTES: 1) CONNECTOR IS BERG 65863-145 OR EQUIVALENT.
2) 6-32 SCREW TERMINAL BARRIER STRIPS.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS8".
4) LITTLE FUSE 251001 OR EQUIVALENT.
5) LITTLE FUSE 251005 OR EQUIVALENT.



SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB16



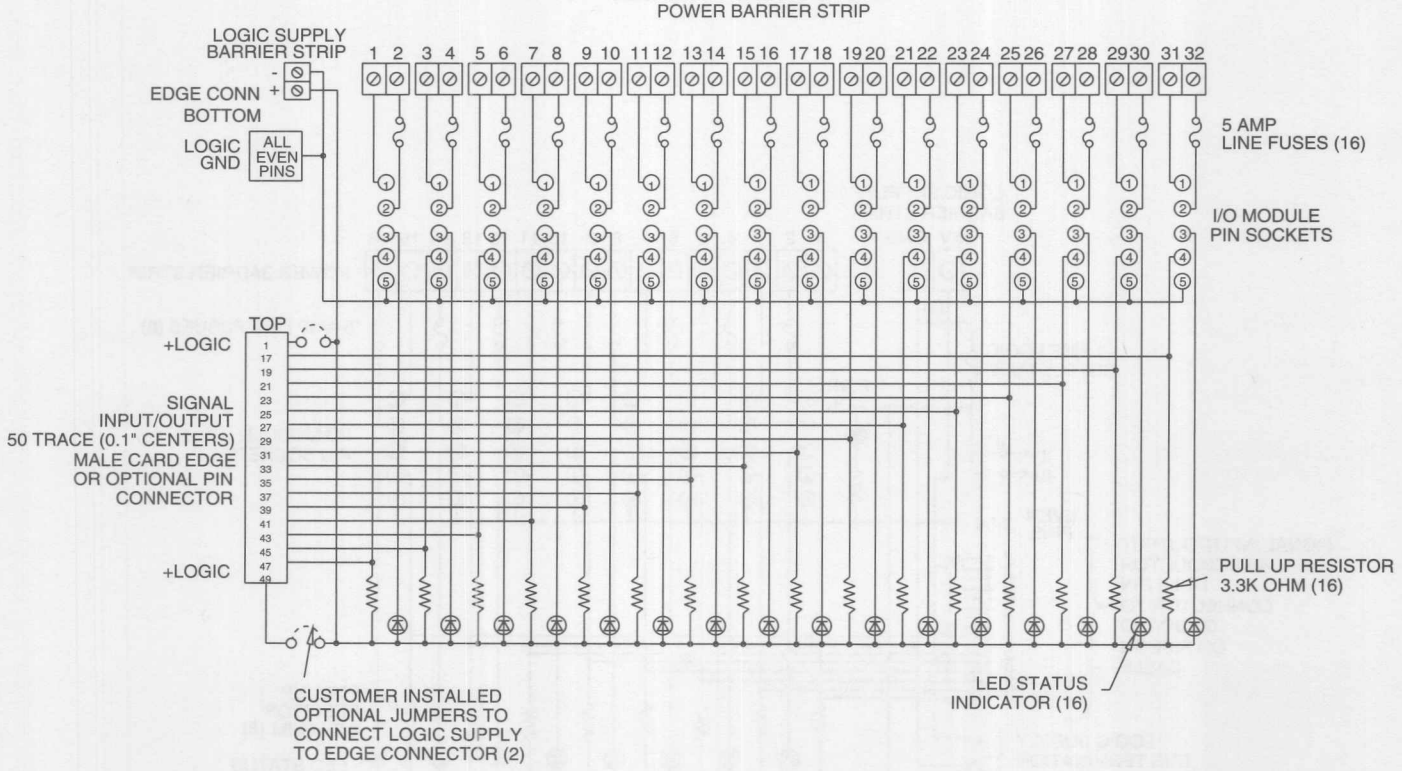
NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT MALE PIN CONNECTOR FOR THE PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.

2) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.

3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS2" AND 2 EACH "JS8".

4) LITTLE FUSE 251005 OR EQUIVALENT.

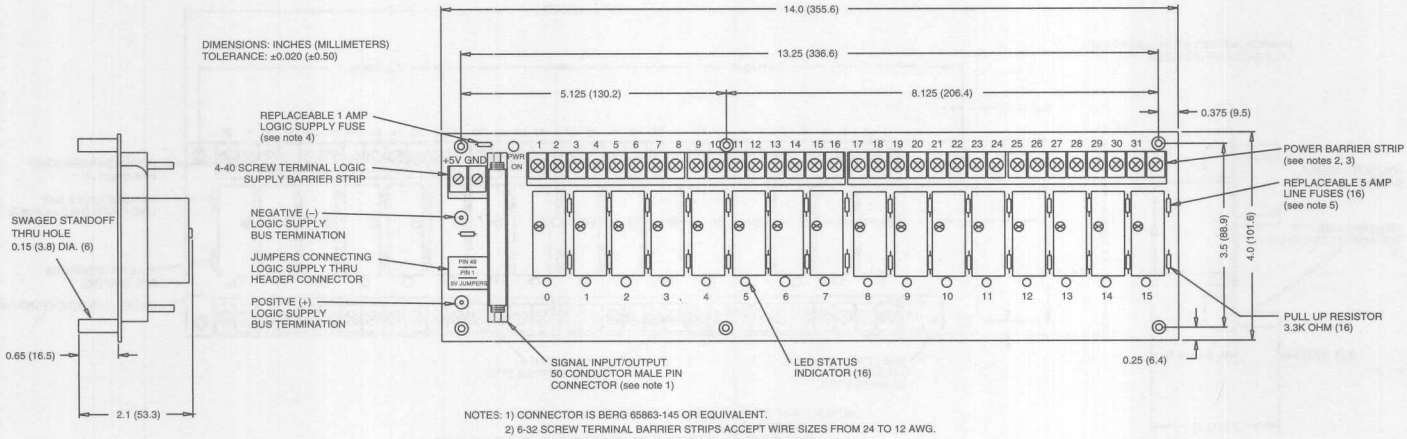
5) LITTLE FUSE 251001 OR EQUIVALENT.



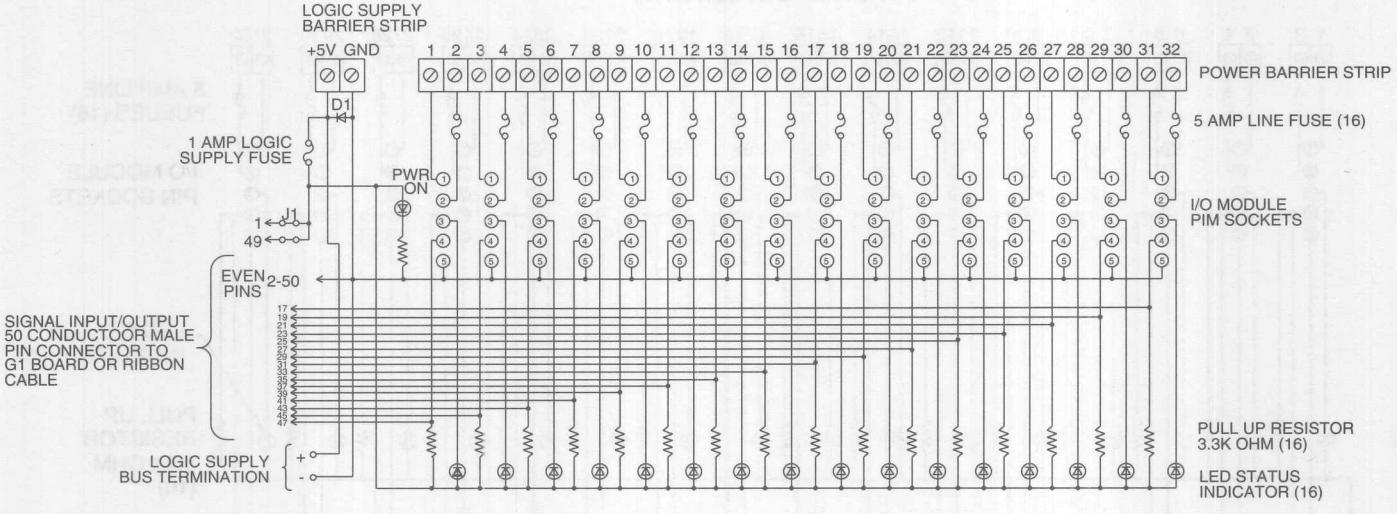
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB16H



NOTES: 1) CONNECTOR IS BERG 65863-145 OR EQUIVALENT.
2) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS2" AND 2 EACH "JS8".
4) LITTLE FUSE 251001 OR EQUIVALENT.
5) LITTLE FUSE 251005 OR EQUIVALENT.

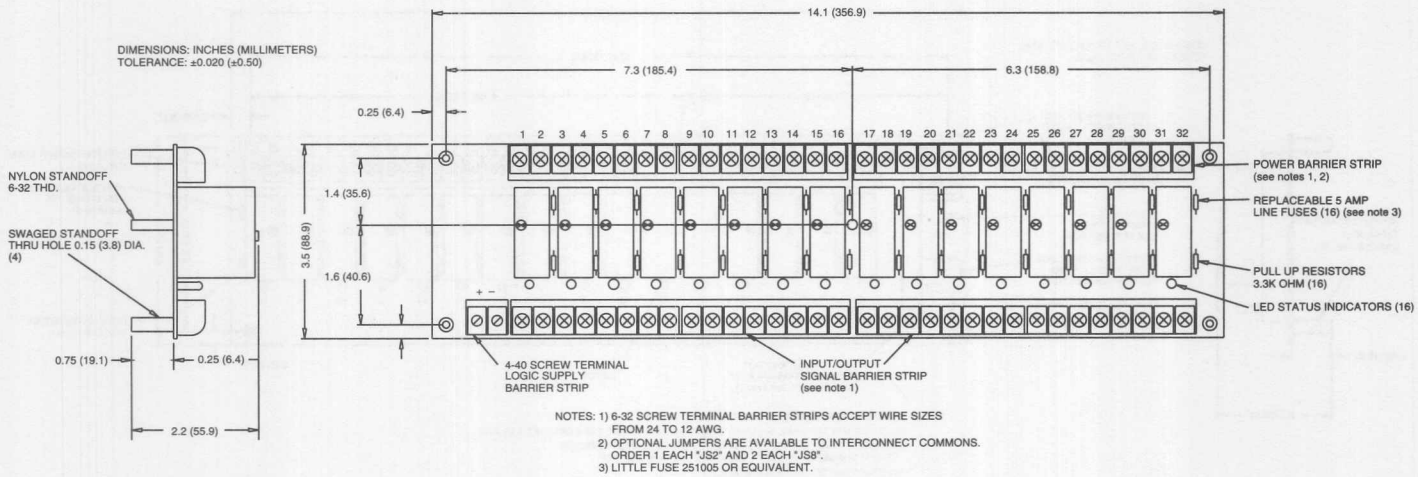


SCMD

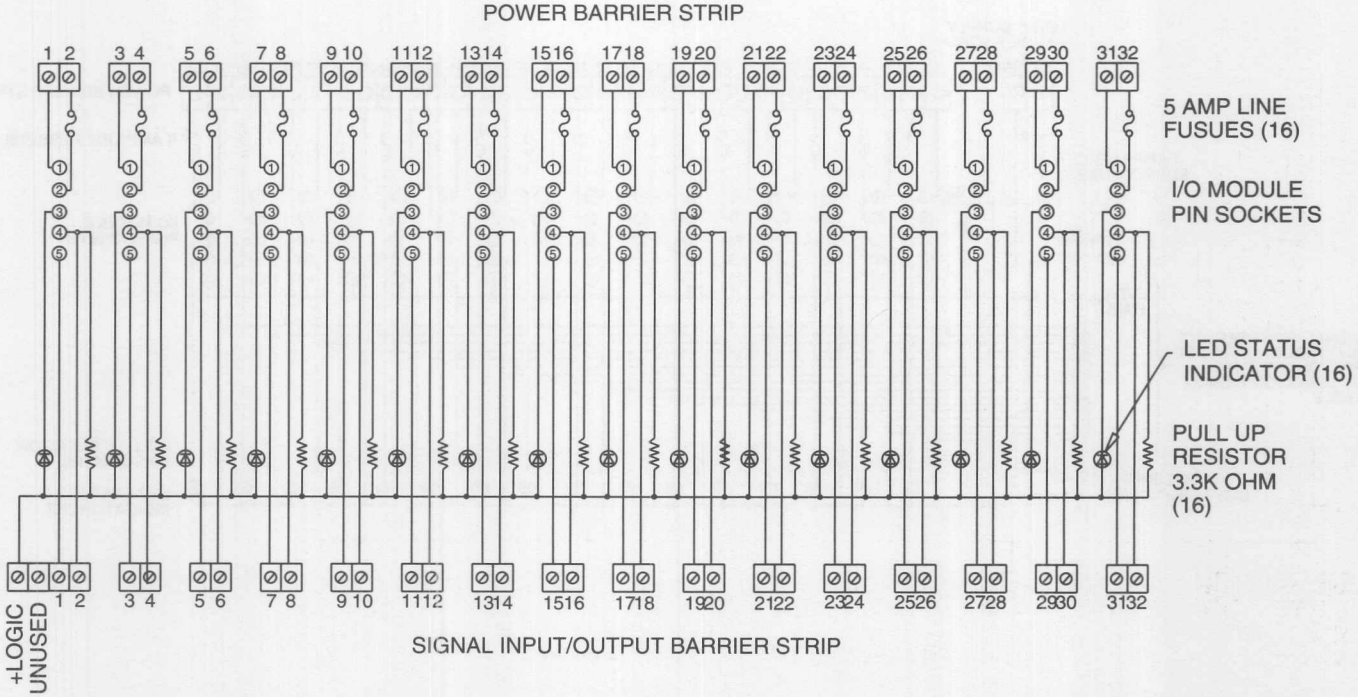
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB16S



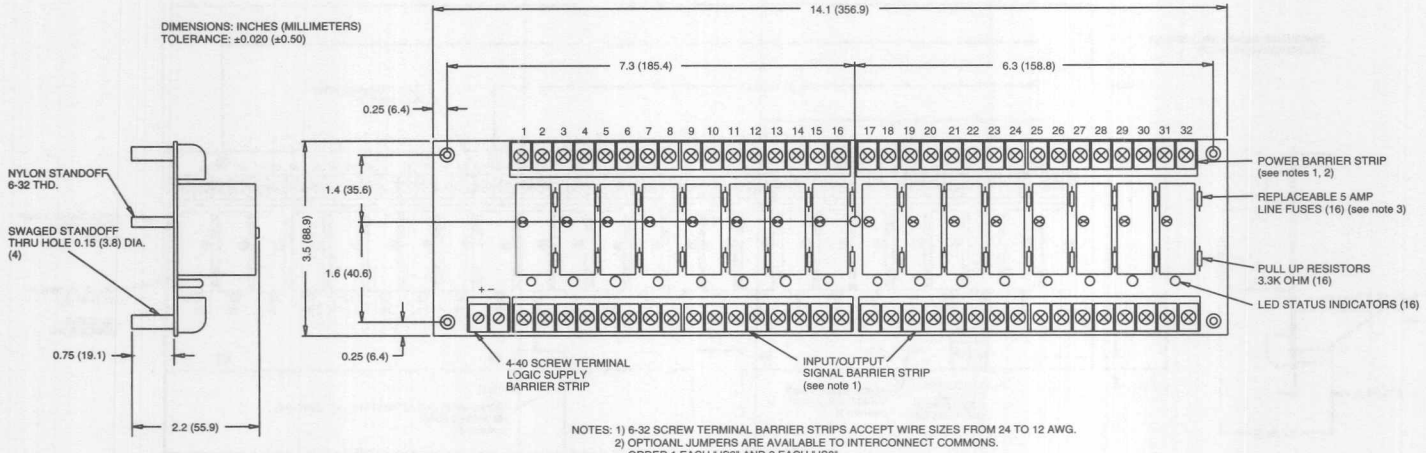
NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.
2) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT COMMONS. ORDER 1 EACH "JS2" AND 2 EACH "JS8".
3) LITTLE FUSE 251005 OR EQUIVALENT.



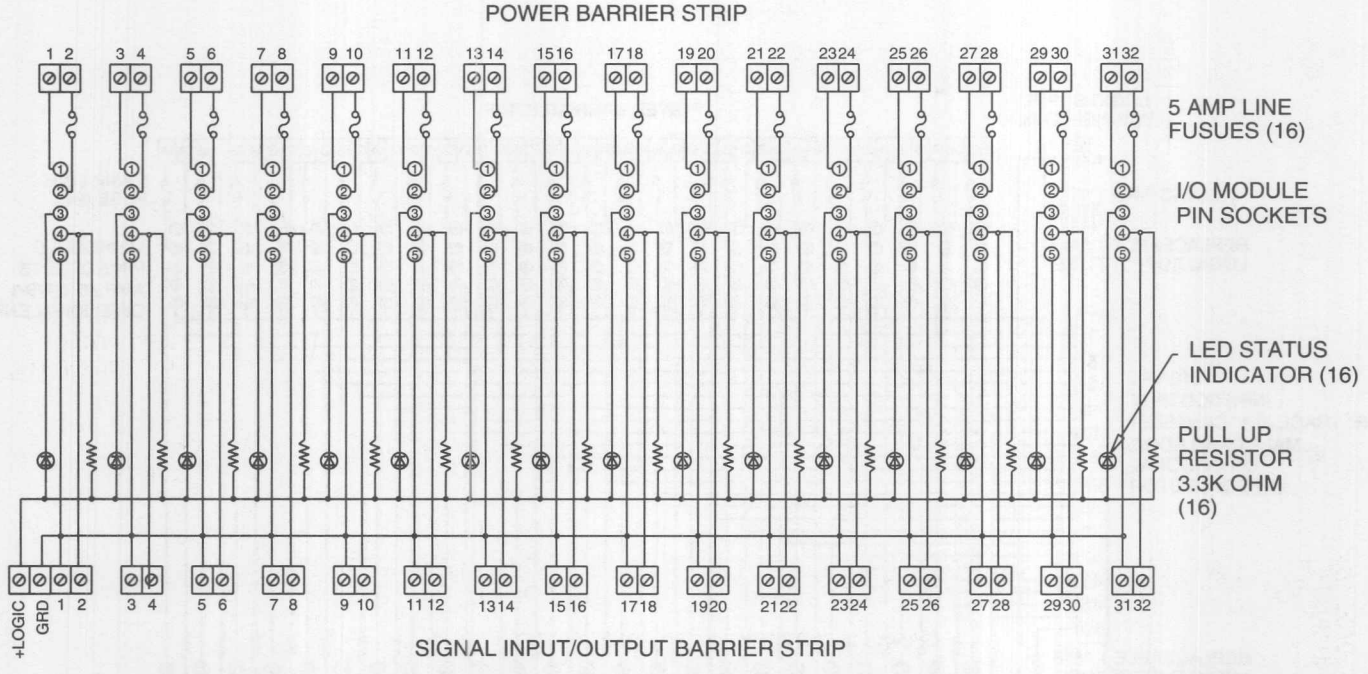
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB16T



NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.
2) OPTIOANL JUMPERS ARE AVAILABLE TO INTERCONNECT COMMONS.
ORDER 1 EACH "JS2" AND 2 EACH "JS8".
3) LITTLE FUSE 251005 OR EQUIVALENT.

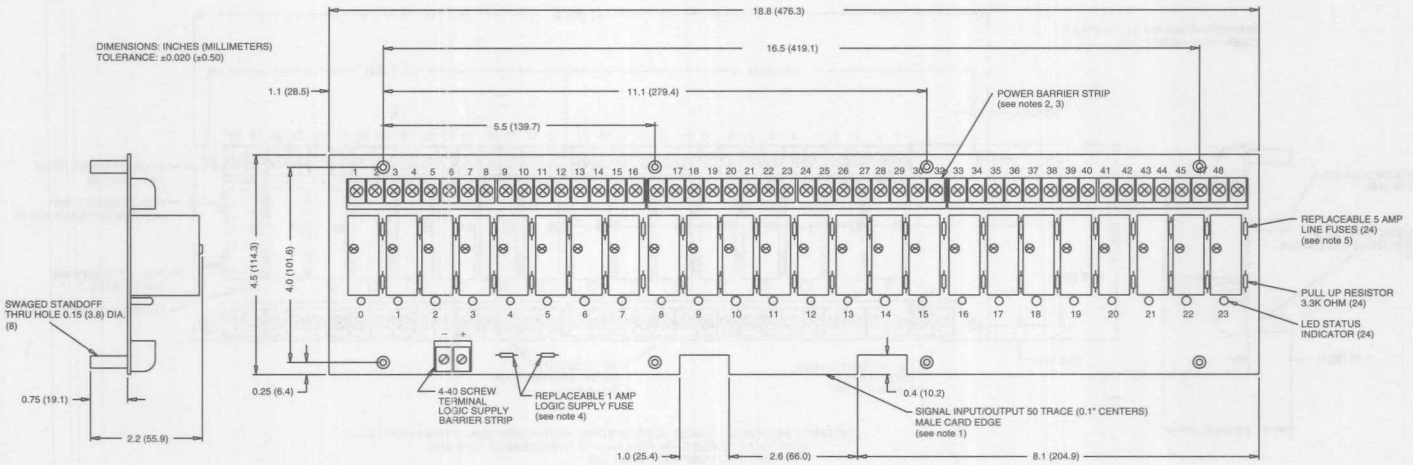


SCMD

SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB24



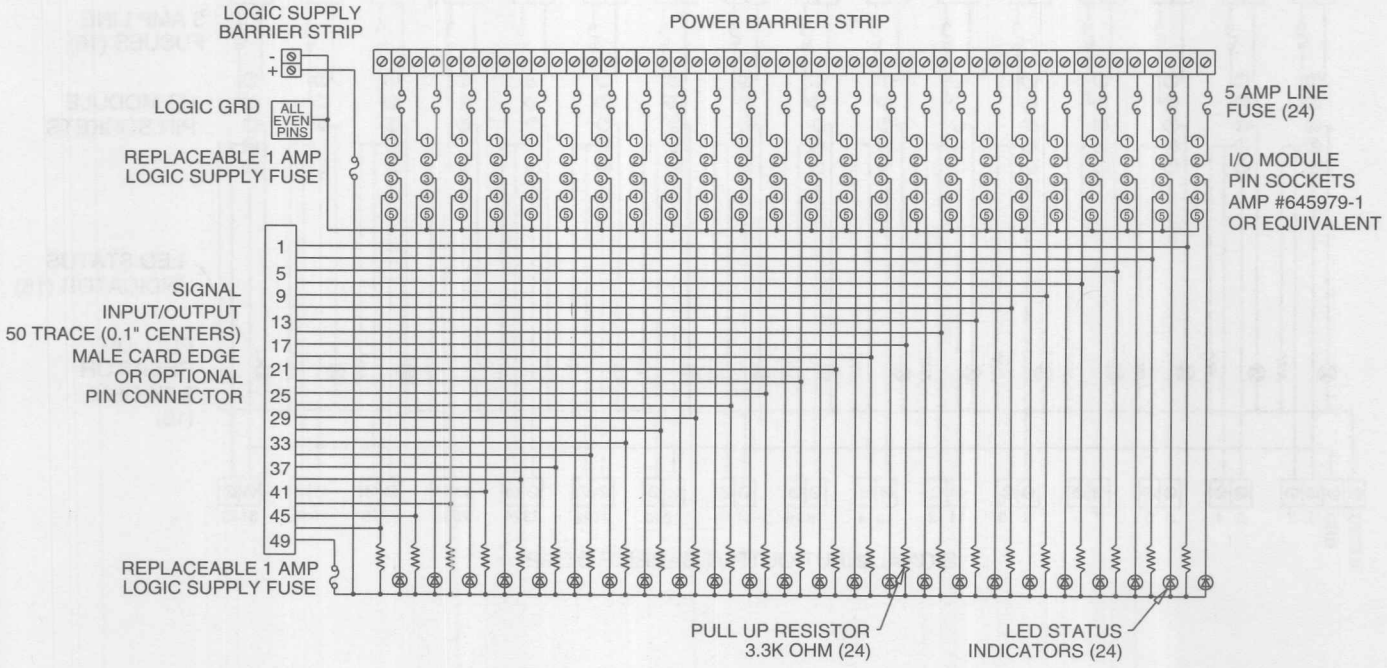
NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALANT MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.

2) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.

3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 2 EACH "JS2" AND 3 EACH "JS8".

4) LITTLE FUSE 251001 OR EQUIVALENT.

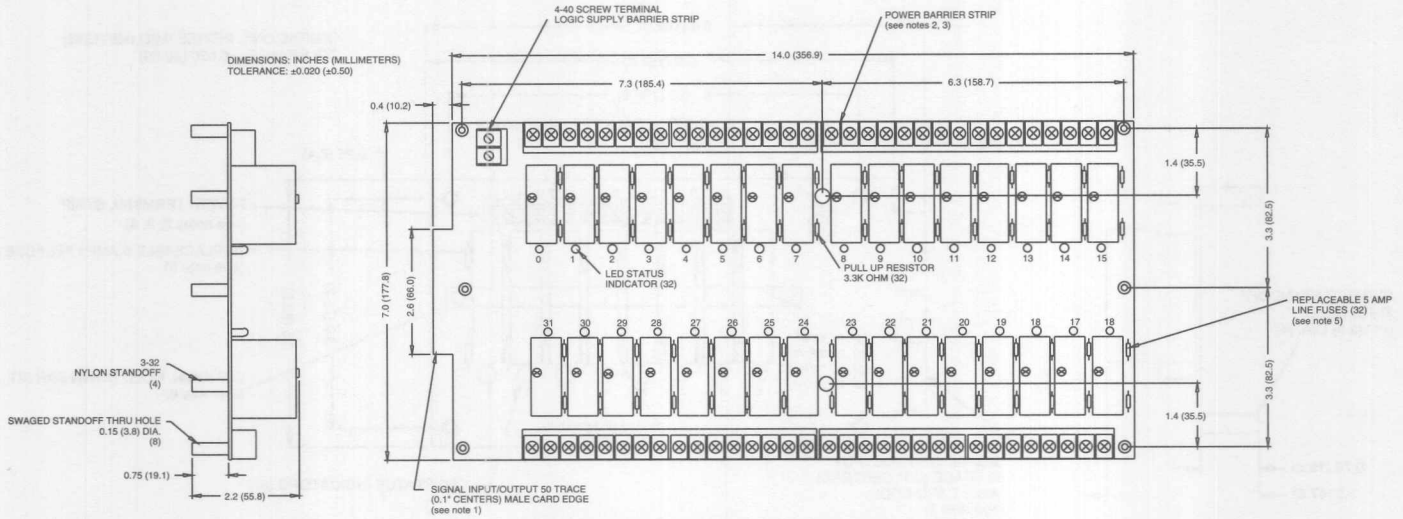
5) LITTLE FUSE 251005 OR EQUIVALENT.



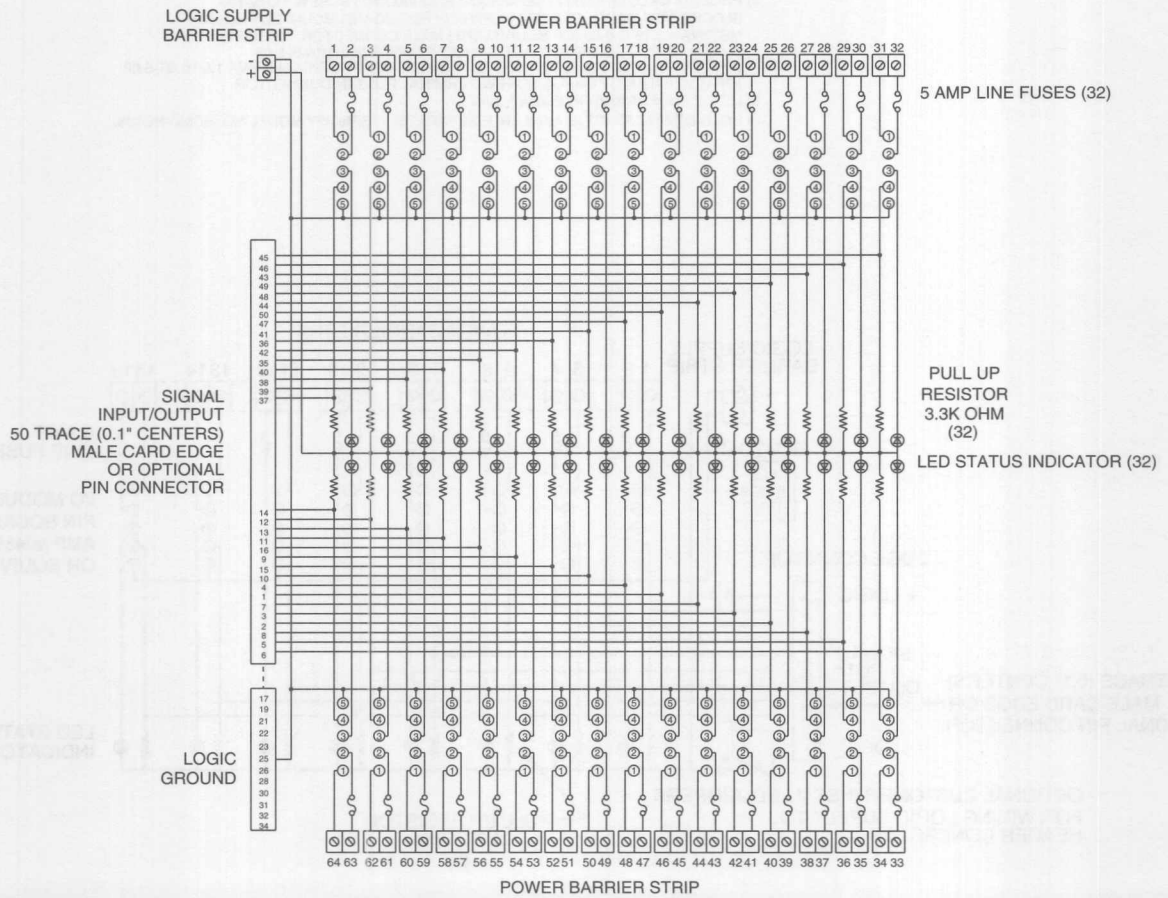
SCMD DIGITAL I/O MODULE BACKPANELS

FOR FULL-SIZED MODULES (compatible with miniature modules)

SCMD-PB32D



NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65683-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.
2) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 2 EACH "JS2" AND 4 EACH "JS8".
4) LITTLE FUSE 251001 OR EQUIVALENT.
5) LITTLE FUSE 251005 OR EQUIVALENT.

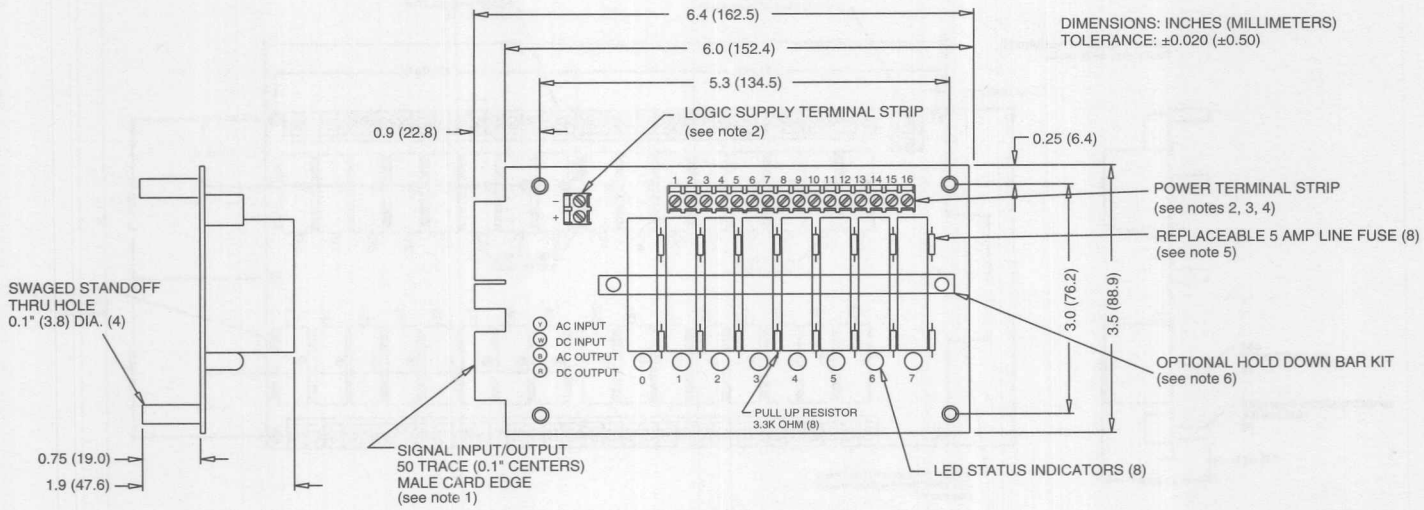


SCMD

SCMD DIGITAL I/O MODULE BACKPANELS

FOR MINIATURE MODULES

SCMD-PB8SM



NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.

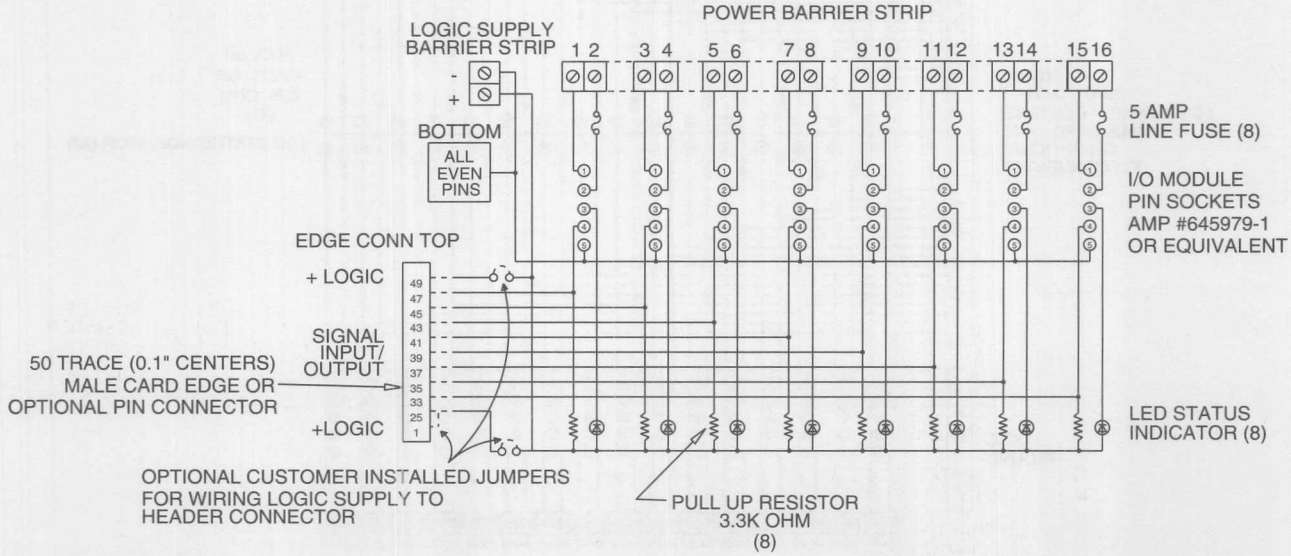
2) 4-40 SCREW TERMINAL STRIPS ACCEPT WIRE SIZES FROM 26 TO 14 AWG.

3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JM8".

4) PHOENIX MKD51.5 5.08mm SERIES (OR EQUIVALENT) SCREW TERMINAL BLOCKS STANDARD. SPECIFY SUFFIX "A" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR. SPECIFY SUFFIX "B" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR AND MATING PHOENIX MSTBVA 1.5/16-ST-5.08 (OR EQUIVALENT) FEMALE, SCREW-TERMINAL PLUG-IN CONNECTOR.

5) LITTLE FUSE 251005 OR EQUIVALENT.

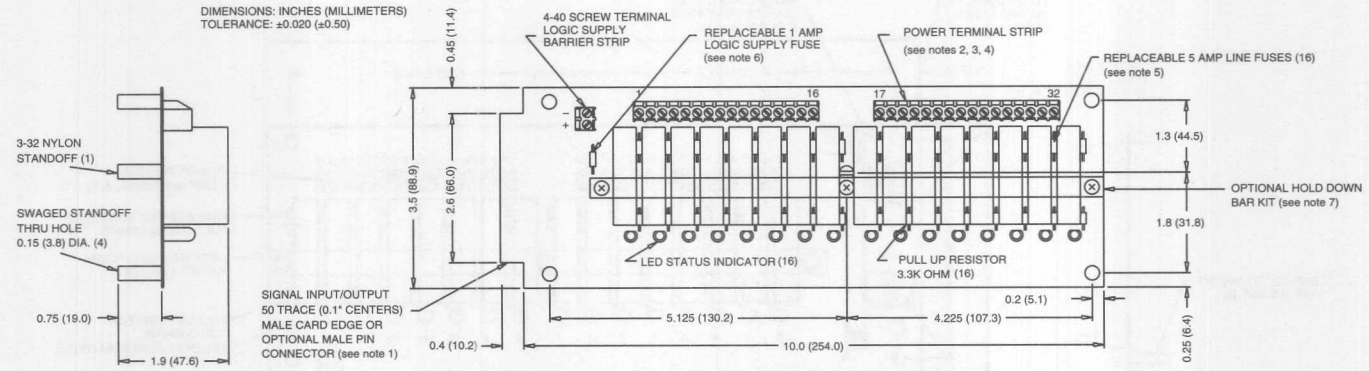
6) HOLD-DOWN BAR KIT IS AVAILABLE SEPARATELY. SPECIFY MODEL NO. SCMD-HD328.



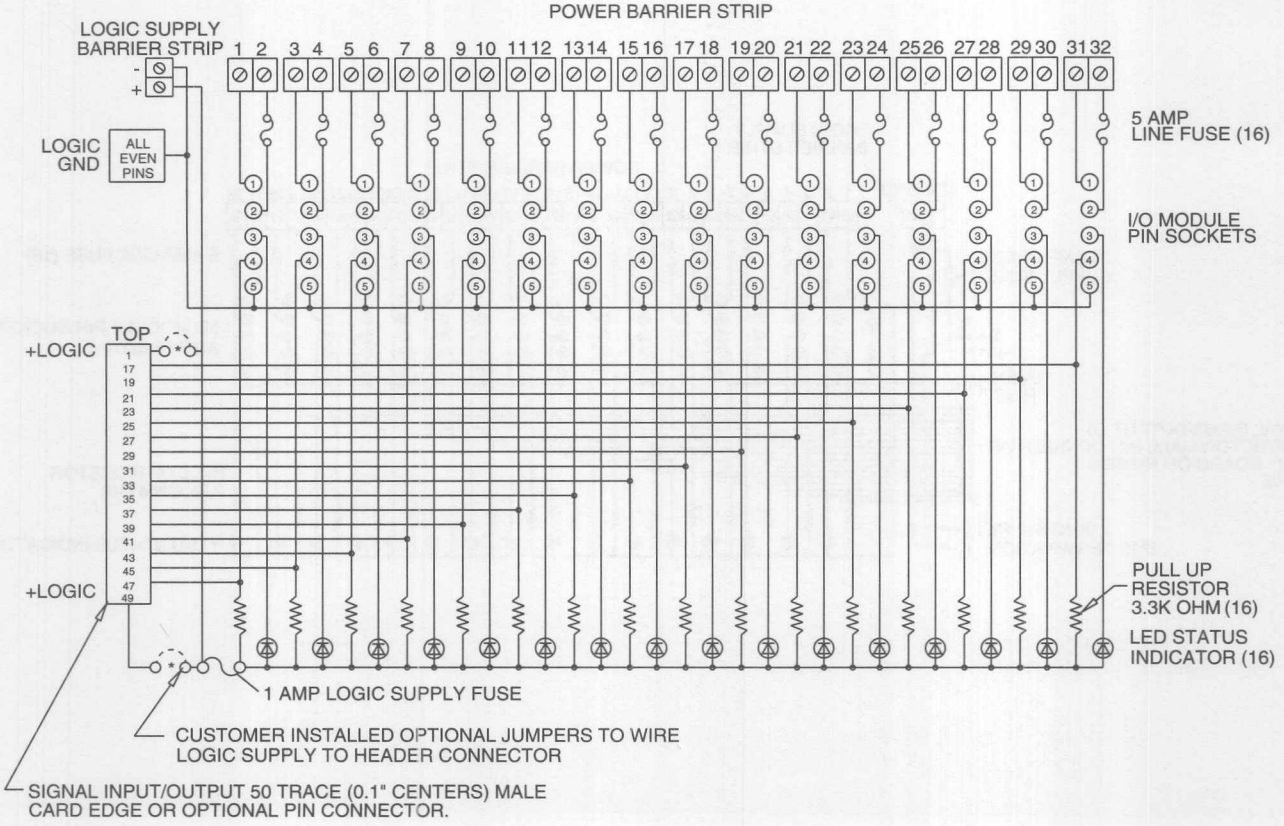
SCMD DIGITAL I/O MODULE BACKPANELS

FOR MINIATURE MODULES

SCMD-PB16SM



NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.
2) 6-32 SCREW TERMINAL BARRIER STRIPS ACCEPT WIRE SIZES FROM 24 TO 12 AWG.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP ORDER 1 EACH "JM2" AND 2 EACH "JM8".
4) PHOENIX MKDS1.5 5.08mm SERIES (OR EQUIVALENT) SCREW TERMINAL BLOCKS STANDARD. SPECIFY SUFFIX "A" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR. SPECIFY SUFFIX "B" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR AND MATING PHOENIX MSTBVA 1.5/16-ST-5.08 (OR EQUIVALENT) FEMALE. SCREW-TERMINAL PLUG-IN CONNECTOR.
5) LITTLE FUSE 251001 OR EQUIVALENT.
6) LITTLE FUSE 251005 OR EQUIVALENT.
7) HOLD-DOWN BAR KIT IS AVAILABLE SEPARATELY. SPECIFY MODEL NO. SCD-HD329.

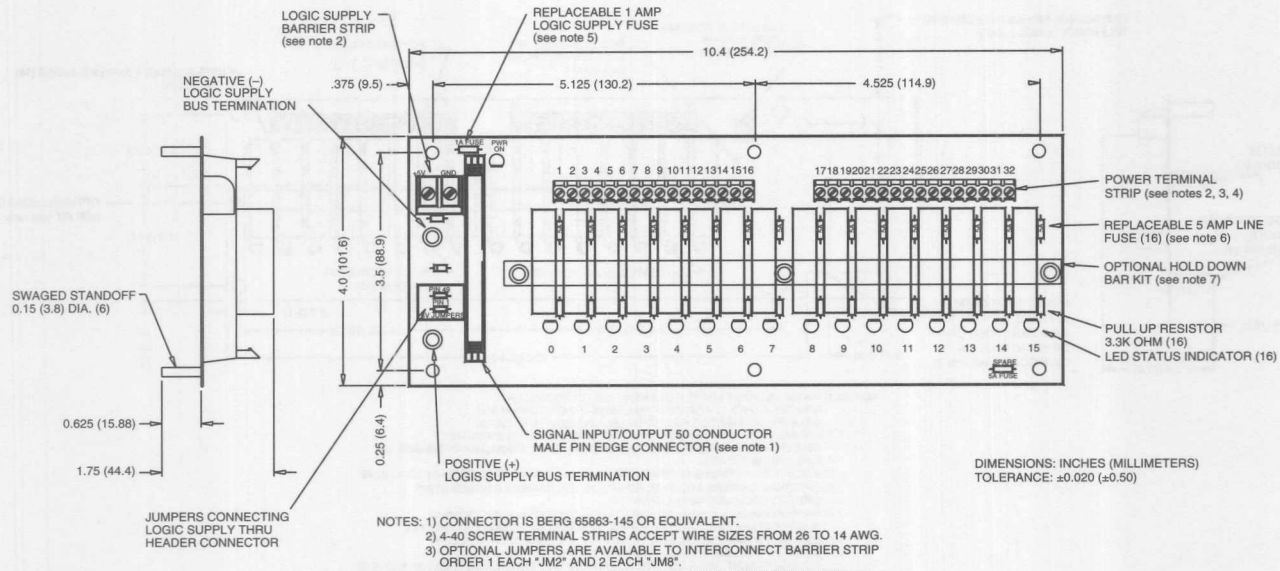


SCMD

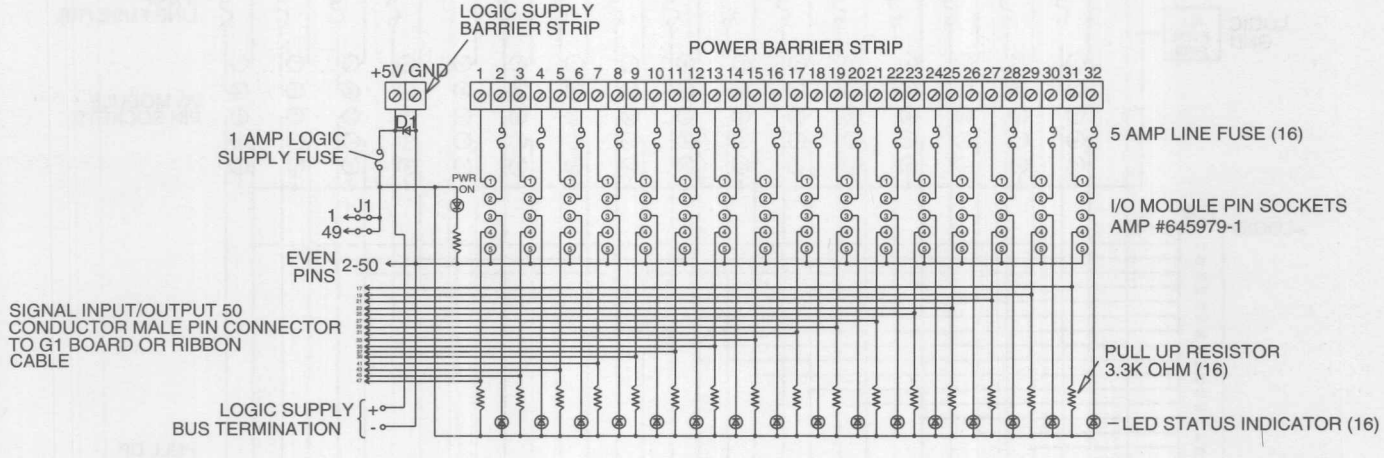
SCMD DIGITAL I/O MODULE BACKPANELS

FOR MINIATURE MODULES

SCMD-PB16SMH



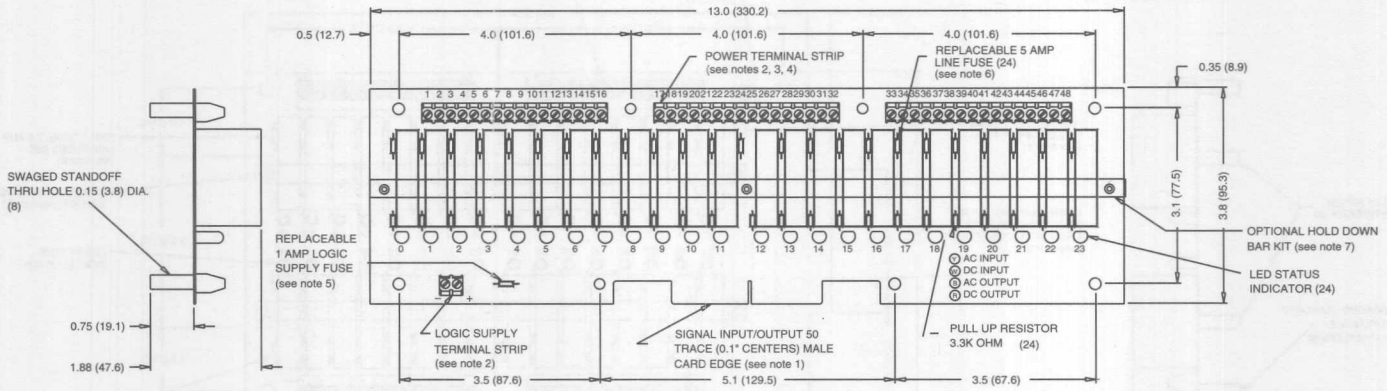
NOTES: 1) CONNECTOR IS BERG 65863-145 OR EQUIVALENT.
2) 4-40 SCREW TERMINAL STRIPS ACCEPT WIRE SIZES FROM 26 TO 14 AWG.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP ORDER 1 EACH "JM2" AND 2 EACH "JM8".
4) PHOENIX MKD51.5 5.08mm SERIES (OR EQUIVALENT) SCREW TERMINAL BLOCKS STANDARD. SPECIFY SUFFIX "A" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR. SPECIFY SUFFIX "B" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR AND MATING PHOENIX MSTBVA 1.5/16-ST-5.08 (OR EQUIVALENT) FEMALE. SCREW-TERMINAL PLUG-IN CONNECTOR.
5) LITTLE FUSE 251001 OR EQUIVALENT.
6) LITTLE FUSE 251005 OR EQUIVALENT.
7) HOLD-DOWN BAR KIT IS AVAILABLE SEPARATELY. SPECIFY MODEL NO. SCMD-HD329.



SCMD DIGITAL I/O MODULE BACKPANELS

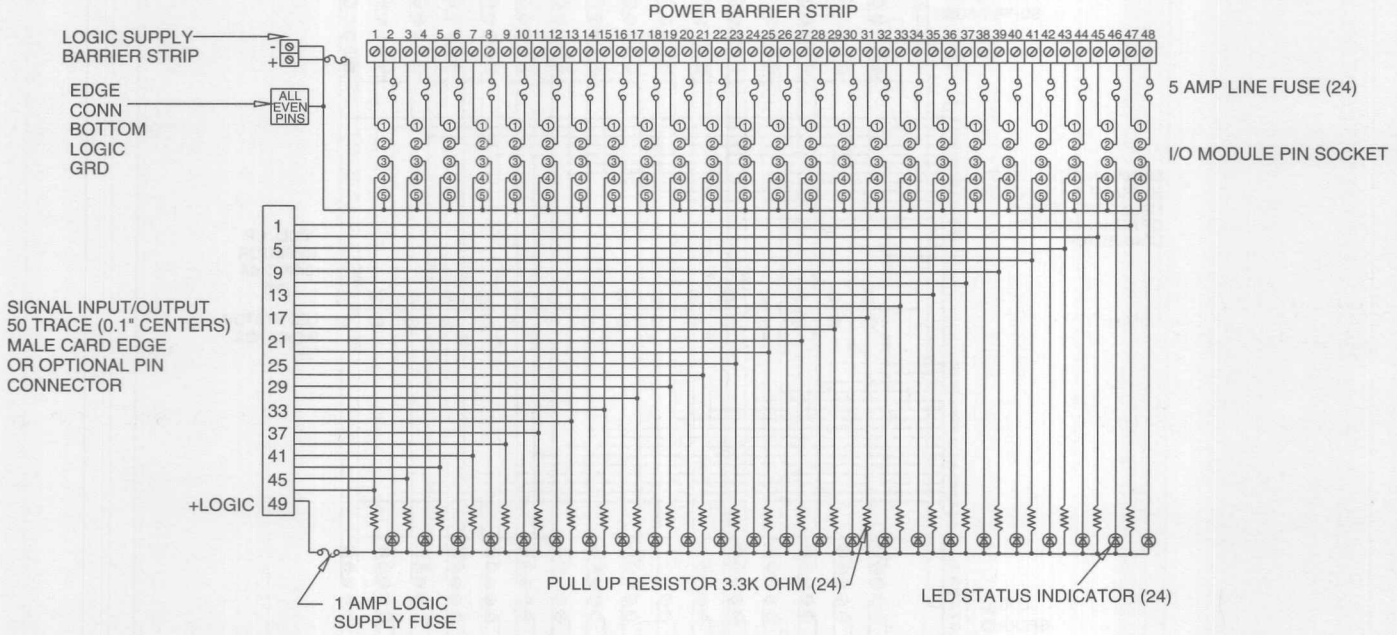
FOR MINIATURE MODULES

SCMD-PB24SM



DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT.
SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT
MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE
CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145
OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD
CABLE CONNECTION.
2) 4-40 SCREW TERMINAL STRIPS ACCEPT WIRE SIZES FROM 26 TO 14 AWG.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP
ORDER 3 EACH "JM8".
4) PHOENIX MKD51.5 5.08mm SERIES (OR EQUIVALENT) SCREW TERMINAL
BLOCKS STANDARD. SPECIFY SUFFIX "A" FOR BOARD-MOUNTED PHOENIX
MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR. SPECIFY
SUFFIX "B" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08
(OR EQUIVALENT) MALE CONNECTOR AND MATING PHOENIX MSTBVA 1.5/16-ST-5.08
(OR EQUIVALENT) FEMALE. SCREW-TERMINAL PLUG-IN CONNECTOR.
5) LITTLE FUSE 251001 OR EQUIVALENT.
6) LITTLE FUSE 251005 OR EQUIVALENT.
7) HOLD-DOWN BAR KIT IS AVAILABLE SEPARATELY. SPECIFY MODEL NO. SCMD-HC323.

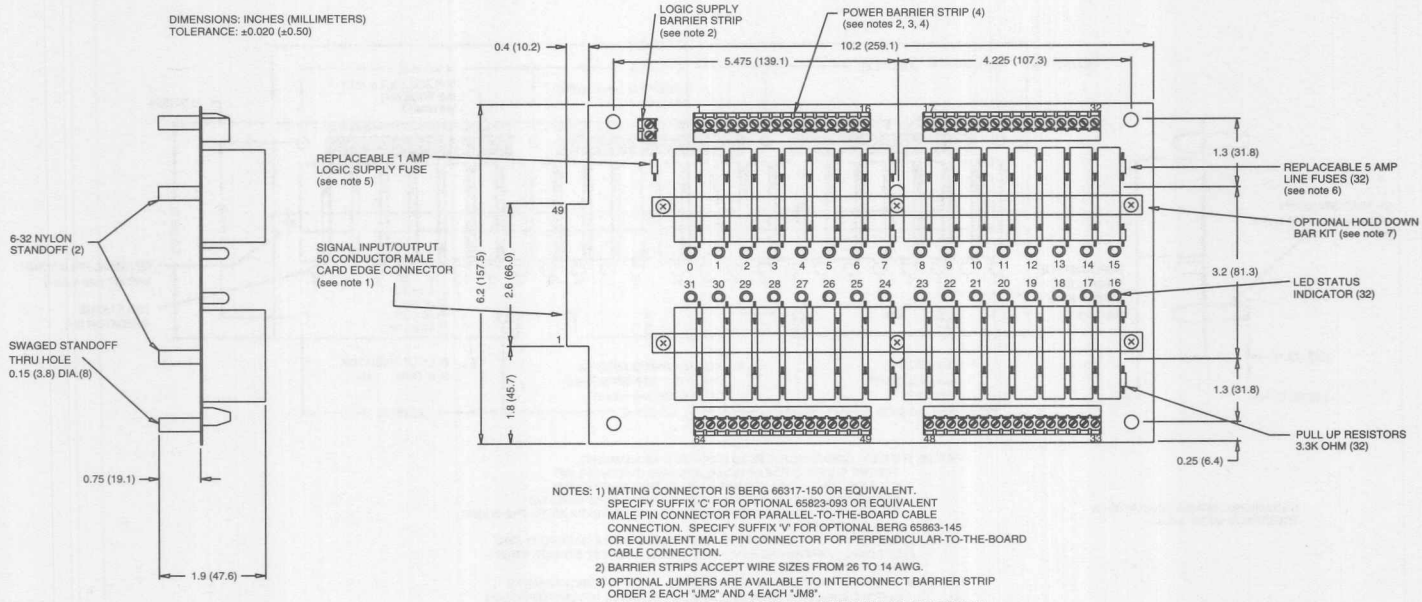


SCMD

SCMD DIGITAL I/O MODULE BACKPANELS

FOR MINIATURE MODULES

SCMD-PB32SM



NOTES: 1) MATING CONNECTOR IS BERG 66317-150 OR EQUIVALENT. SPECIFY SUFFIX 'C' FOR OPTIONAL 65823-093 OR EQUIVALENT MALE PIN CONNECTOR FOR PARALLEL-TO-THE-BOARD CABLE CONNECTION. SPECIFY SUFFIX 'V' FOR OPTIONAL BERG 65863-145 OR EQUIVALENT MALE PIN CONNECTOR FOR PERPENDICULAR-TO-THE-BOARD CABLE CONNECTION.

2) BARRIER STRIPS ACCEPT WIRE SIZES FROM 26 TO 14 AWG.

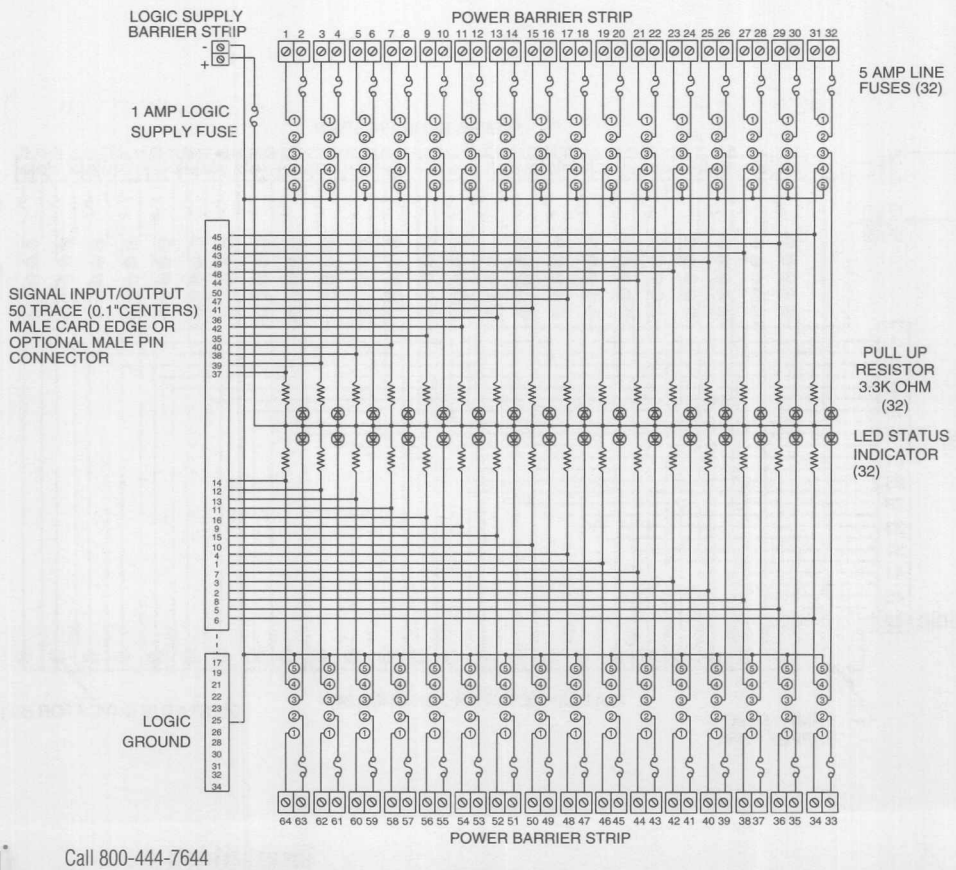
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP ORDER 2 EACH "JM2" AND 4 EACH "JM8".

4) PHOENIX MKD51.5 5.08mm SERIES (OR EQUIVALENT) SCREW TERMINAL BLOCKS STANDARD. SPECIFY SUFFIX "A" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR. SPECIFY SUFFIX "B" FOR BOARD-MOUNTED PHOENIX MSTBVA 1.5/16-G-5.08 (OR EQUIVALENT) MALE CONNECTOR AND MATING PHOENIX MSTBVA 1.5/16-ST-5.08 (OR EQUIVALENT) FEMALE. SCREW-TERMINAL PLUG-IN CONNECTOR.

5) LITTLE FUSE 251001 OR EQUIVALENT.

6) LITTLE FUSE 251005 OR EQUIVALENT.

7) HOLD DOWN BAR KIT IS AVAILABLE. ORDER KIT SCMD-HD330.

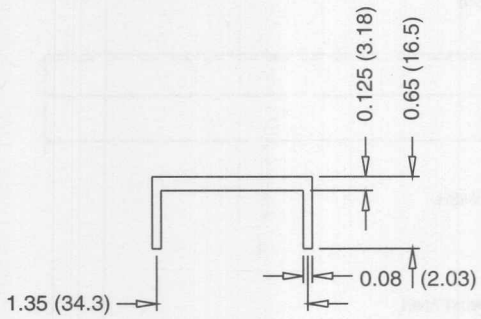


JUMPERS FOR I/O MODULE BACKPANELS

DESCRIPTION

The J-series of copper jumpers are used to connect the common ("C" labeled) terminals of digital I/O module mounting boards. The two-position jumpers are used for electrical connection between barrier strips, and the 4 or 8-position jumpers connect common points within a barrier strip. All jumpers are made from 0.031 ±0.002 inch thick copper and plated with bright tin. The JS and JM jumpers are used with backpanels for full-sized and miniature modules, respectively.

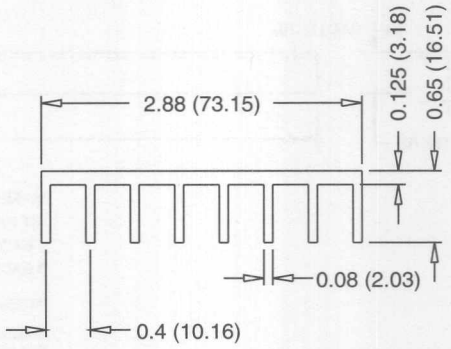
SCMD-JM2



MATERIAL: 0.031" (0.787) TIN PLATED COPPER

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

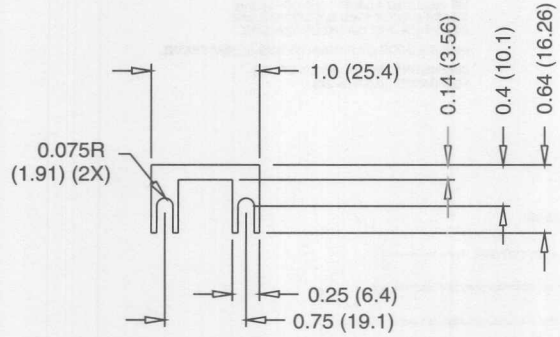
SCMD-JM8



MATERIAL: 0.031" (0.787) TIN PLATED COPPER

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

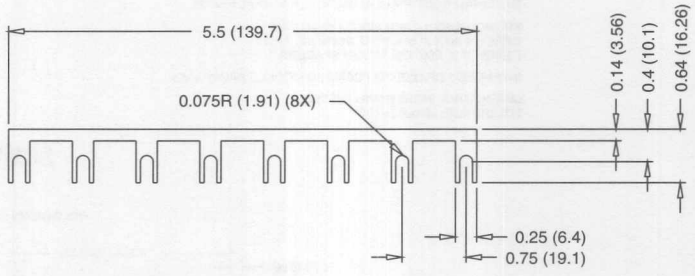
SCMD-JS2



MATERIAL: 0.031" (0.787) TIN PLATED COPPER

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

SCMD-JS8



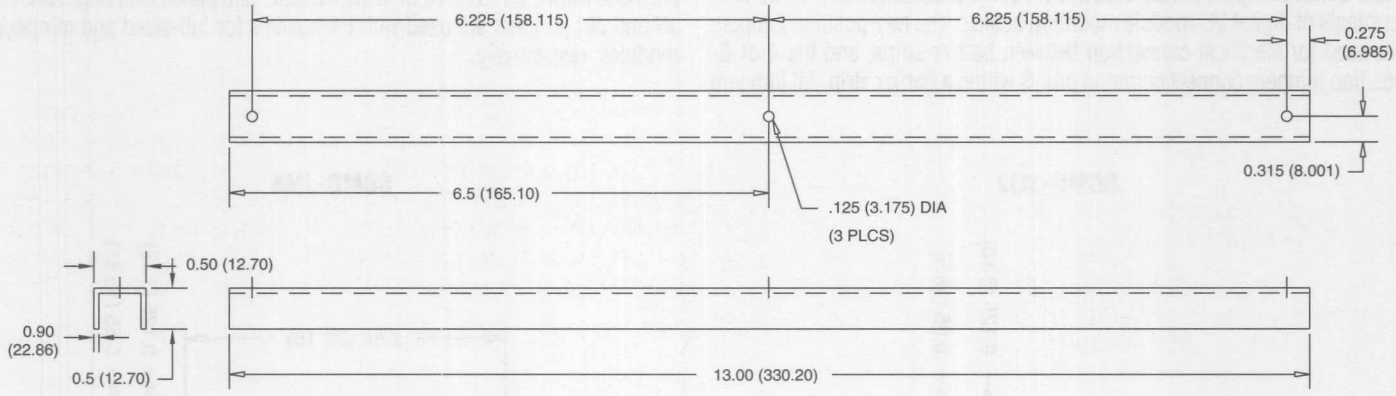
MATERIAL: 0.031" (0.787) TIN PLATED COPPER

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

DIGITAL I/O MODULE HOLD DOWN BAR KITS

SCMD-HD323

HOLD-DOWN BAR KIT NUMBER 11-06-323



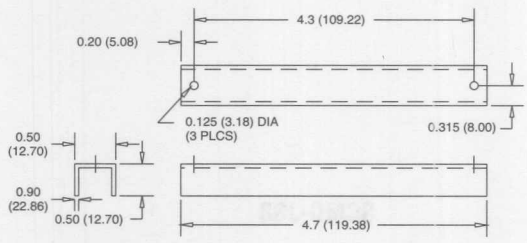
MATERIAL: 0.062" WALL ALUMINUM, NATURAL FINISH.
KIT INCLUDES 1 EACH HOLD-DOWN BAR,
3 EACH 4-40 X 2" MACHINE SCREWS, AND
3 EACH 1.00" X .250" DIA NYLON SPACERS.

INTENDED FOR USE ON PB24SM I/O MODULE BACKPANEL.

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

SCMD-HD328

HOLD-DOWN BAR KIT NUMBER 11-06-328



MATERIAL: 0.062" WALL ALUMINUM, NATURAL FINISH.

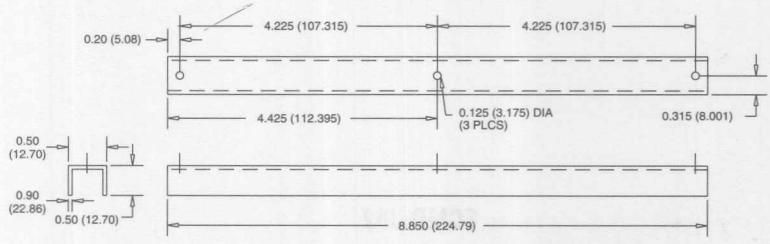
KIT INCLUDES 1 EACH HOLD-DOWN BAR,
2 EACH 4-40 X 2" MACHINE SCREWS, AND
2 EACH 1" X .250" DIA NYLON SPACERS.

INTENDED FOR USE ON PB8SM I/O MODULE BACKPANEL.

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

SCMD-HD329

HOLD-DOWN BAR KIT NUMBER 11-06-329



MATERIAL: 0.062" WALL ALUMINUM, NATURAL FINISH.

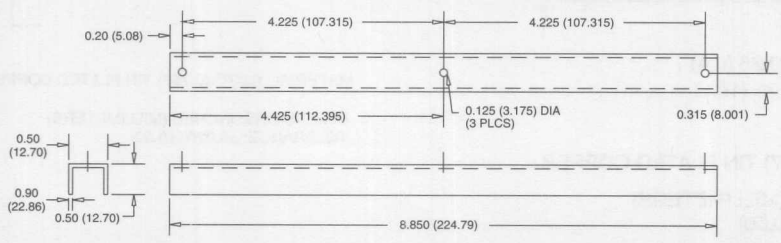
KIT INCLUDES 1 EACH HOLD-DOWN BAR,
3 EACH 4-40 X 2" MACHINE SCREWS, AND
3 EACH 1" X .250" DIA NYLON SPACERS.

INTENDED FOR ON PB16SM I/O MODULE BACKPANEL.

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

SCMD-HD330

HOLD-DOWN BAR KIT NUMBER 11-06-330



MATERIAL: 0.062" WALL ALUMINUM, NATURAL FINISH.

KIT INCLUDES 2 EACH HOLD-DOWN BARS,
6 EACH 4-40 X 2" MACHINE SCREWS, AND
6 EACH 1" X .250" DIA NYLON SPACERS.

INTENDED FOR USE ON PB32SM I/O MODULE BACKPANEL.

DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.50)

WARRANTY

GENERAL:

Seller warrants that its products furnished hereunder will, at the time of delivery, be free from defects in material and workmanship and will conform to Seller's applicable specifications or, if appropriate, to Buyer's specifications accepted in writing by Seller. Seller's obligation or liability to Buyer for products which do not conform to the above stated warranty shall be limited to Seller, at Seller's sole discretion, either repairing, replacing, or refunding the purchase price of the nonconforming product(s) provided that written notice of said nonconformance is received by Seller within twelve (12) months from the date of initial delivery.

Further, all products warranted hereunder for which Seller has received timely notice of nonconformance must be returned F.O.B. Seller's plant within thirty (30) days after the expiration of the warranty period set forth above.

These warranties provided herein shall not apply to any products which Seller determines have, by Buyer or otherwise, been subjected to operating and/or environmental conditions in excess of the maximum values established therefore in the applicable specifications, or otherwise have been the subject of mishandling, misuse, neglect, improper testing, repair, alteration, or damage.

THESE WARRANTIES EXTEND TO BUYER ONLY AND NOT TO BUYER'S CUSTOMERS OR USERS OF BUYER'S PRODUCT AND ARE IN LIEU OF ALL OTHER IMPLIED WARRANTIES WHETHER EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SELLER BE LIABLE FOR INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES. SELLER'S LIABILITY FOR ANY CLAIM OF ANY KIND SHALL IN NO CASE EXCEED THE OBLIGATION OR LIABILITY SPECIFIED IN THIS WARRANTY CLAUSE.

TECHNICAL ASSISTANCE:

Seller's warranty as herein above set forth shall not be enlarged, diminished or affected by, and no obligation or liability shall arise or grow out of, Seller's rendering of technical advice, facilities or service in connection with Buyer's order of the goods furnished hereunder.

APPLICATION SUPPORT

Dataforth provides timely, high-quality product support. Just call

1-800-444-7644 TOLL-FREE

and ask for Application Engineering

RETURNS/REPAIR POLICY

All warranty and repair requests should be directed to the Dataforth Customer Service Department at (602) 741-1404. If a product return is required, request a Return Material Authorization (RMA) number. You should be ready to provide the following information:

1. Complete product model number.
2. Product serial number.
3. Name, address, and telephone number of person returning product.
4. Special repair instructions.
5. Purchase order number for out-of-warranty repairs.

The product should be carefully packaged, making sure the RMA number appears on the outside of the package, and ship prepaid to:

Dataforth Corporation
2731 E. Elvira Rd.
Tucson, AZ 85706

UNITED STATES SALES DIRECTORY

HOME OFFICE

Dataforth Corporation
2731 E. Elvira Road
Tucson, AZ 85706

Telephone 800-444-7644
Telefax 602-741-0762

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Spokane, WA 99204
(509) 244-3601

ARIZONA
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Winter Springs, FL 32708
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628XX-629XX)
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Panatek Technical Sales
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KD Associates
Linthicum Heights, MD 21090
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Goshen, CT 06756
(203) 491-3585

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